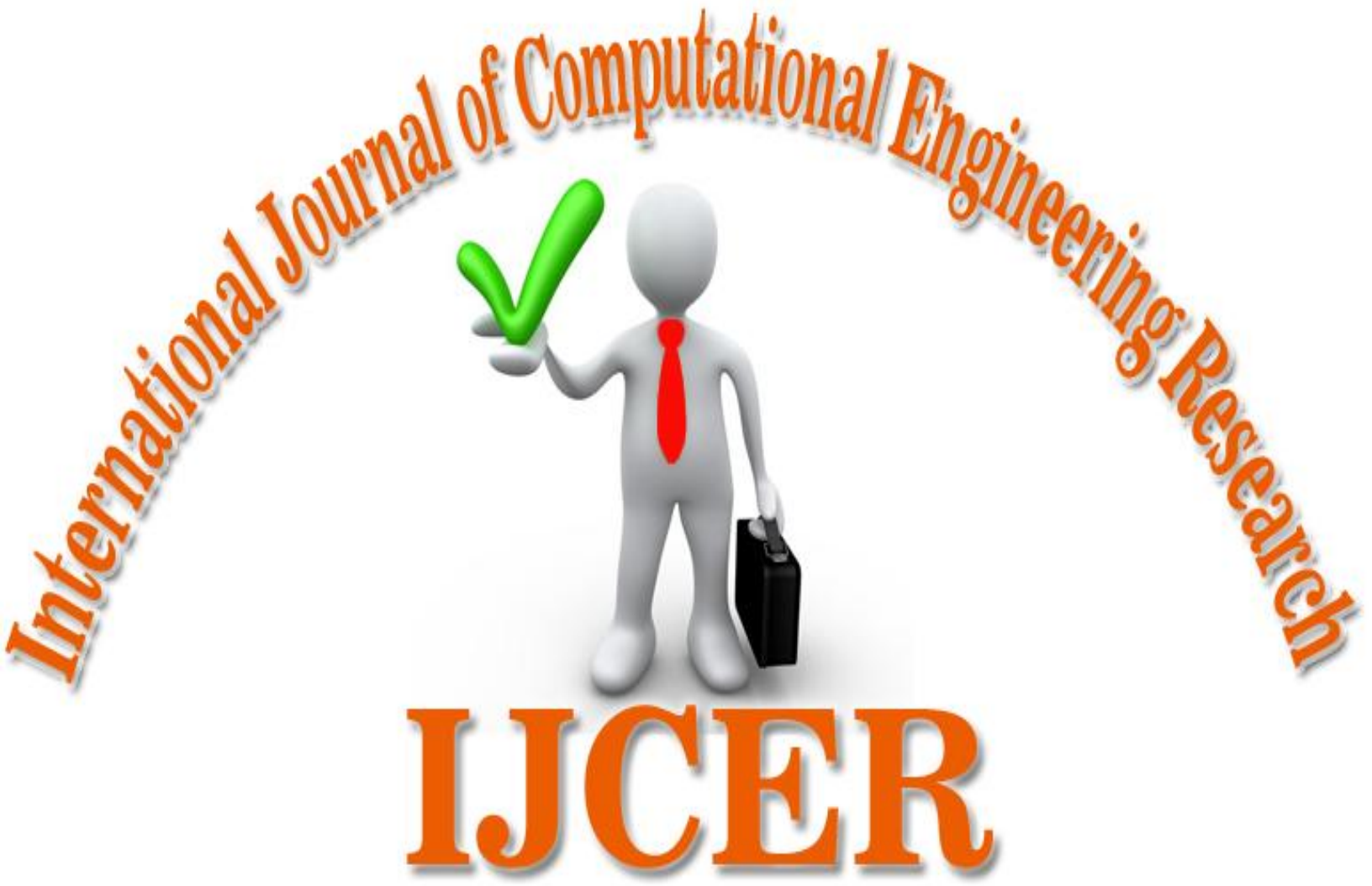


Volume 3, Issue 12, December, 2013

Editorial Board

Editor-In-Chief

Editorial Committees

CONTENTS:

Generalized Sex and Age Specific Body Composition Prediction Equations for Indian Subjects

Ghazala Perveen Khan[1], Munna Khan[2], Shabana Mehfooz[3]

[1,2,3]*Department of Electrical Engineering, Jamia Millia Islamia University, New Delhi, India*

ABSTRACT:

Body composition analysis (BCA) is necessary to yield data about normal growth, maturity, and longer life. By measuring body composition, a person's health status can be more accurately assessed. Bioelectrical impedance analysis (BIA) is a commonly used method for estimating body composition which actually determines the electrical impedance, or opposition to the flow of an electric current through body tissues which can then be used to calculate an estimate of body composition. The method is popular owing to its ease of use, portability of the equipment and it's relatively low cost compared to some other methods of body composition analysis. To the best of our knowledge there were no prediction equations that were validated on Indian subjects. The objective of the study was to develop prediction equations for Fat free mass (FFM) and Total body water (TBW) for Indian subjects based on Bio electrical measurement of weight, age, sex, height and Impedance Index. To predict the same; a form of statistics known as multiple regression Analysis have been used which allows an immeasurable component such as Total Body Water, Fat Free Mass etc. to be predicted from one or more measured variables. The multiple regression analysis of the data is carried out with the help of statistical software R version (2.9.2) which is useful for multiple regression analysis and easy handling of the data. In the current paper; based on the correlation between Total Body water, Fat free Mass, Impedance Index at different frequencies and weight, age, sex and height;8 sets of prediction equations were developed.

KEYWORDS: *Bio Electrical Impedance Analysis, Prediction Equation, Multiple Regression*

I. INTRODUCTION:

It is a well-known fact that India; next only to China, is the second largest country in terms of population in the world. But the health status of the majority of the people is far from satisfactory as compared to China and other developed countries (16). When it comes to health status of the country, there is a large disparity between rural and urban elite class. Even though there is an imminent urbanization phenomenon in the country an important sector of the population still lives in the rural areas and there is large disparity in the lifestyles of people; especially regarding the physical activity of the people living there. This can be reflected in the general body composition of the people. The people in rural areas are particularly active then there counterpart; i.e. the people living in the urban areas. As the country is becoming richer, many people are becoming obese and, like Westerners, they are seeking medical help. According to a survey by the All-India Institute of Medical Sciences; seventy-six per cent of women in the capital, New Delhi, are suffering from abdominal obesity and it is a serious problem for country; because with obesity comes health related problems, from diabetes to heart failure. An estimated 25 million Indians have diabetes, and this is forecast to grow to 57 million by 2025.The rural section of the country is facing the different challenge of under nutrition. It is found mostly in rural areas and is concentrated in a relatively small number of districts and villages; with 10 percent of villages and districts accounting for 27-28 percent of all underweight children. So; all in all, we can say that India is facing the dual challenge of obesity and undernourishment. Individuals who are overweight or obese are at the risk of developing cardiovascular, pulmonary, metabolic disease, osteoarthritis and certain types of cancer. On the other hand underweight individuals are malnourished and have a high risk of fluid-electrolyte imbalances, renal and reproductive disorders. Body composition analysis (BCA) therefore; is necessary to yield data about normal growth, maturity, and longer life.

By measuring body composition, a person's health status can be more accurately assessed. In order to face these challenges there was a need in physiological and nutritional research to assess human body composition analysis.Laboratory method such as densitometry, computer tomography, electrical conductivity, body water by isotope dilution, whole body counting of potassium-40, neutron activation analysis for total body calcium and nitrogen are expensive and are not suited for field studies. Besides these; technique developed for epidemiological surveys, such as anthropometry, skin fold thickness, and infrared interactance are less reliable predictors of body composition. Thus, there was a need for a safe, noninvasive technique that is rapid and convenient and provides reliable and sufficiently accurate estimation of human body composition. Maltron-II Body Composition Analyzer is one such instrument for estimating the body composition of human body. Since the advent of the first commercially available devices in the mid-1980s the method has become popular owing to its ease of use, portability of the equipment and it's relatively low cost compared to some of the other methods of body composition analysis. It is familiar in the consumer market as a simple instrument for estimating body fat. BIA actually determines the electrical impedance, or opposition to the flow of an electric current through body tissues which can then be used to calculate an estimate of body composition. The electrical impedance through the body is measured by passing an excitation current of amplitude of 800µA through electrodes stuck at the right wrist and right ankle of the volunteer, at different frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz. The voltage drop was detected by proximal electrodes. Some of the basic assumptions that were made to measure the impedance of the body were as follows; the human body was assumed to be perfect cylinder, at fixed signal frequency(e.g.,50 KHz). The volume of FFM or TBW of the body was assumed to be directly proportional to L^2 or height^2 and inversely related to Z, since the impedance(Z) to current flow through the body is directly related to the length of conductor(height) and inversely related to the cross sectional area(A): $Z=\rho(L/A)$.Multiplying and diving the right hand side by L we have $Z=\rho(L^2/V)$.Readjusting the equation we have, $V=\rho(L^2/Z)$. Thus; in order to predict volume of Fat Free Mass or Total Body Water of Human body we have to include the term Impedance Index (height^2/Impedance), while developing the generalised prediction equation for the estimation of TBW and FFM of Indian subjects at different frequencies.

II. MATERIALS AND METHODS:

2.1. Literature survey:

A lot of scientists have been contributing in the past, for the development of body composition prediction equations for cohorts of individual belonging to different ethnic groups, age groups, sex and according to their level of physical activity. Martin Wabitch et al. in 1996 developed an equation for the prediction of total body water (TBW) from bioelectrical impedance analysis (BIA) in obese children and adolescents before and after weight reduction using multiple-regression analysis. Shumei S Sun et al. developed sex-specific BIA equations to predict total body water (TBW) and fat-free mass (FFM) with the use of a multicomponent model for children and adults. Kim et al. in 1994 developed the BIA prediction equation for 84 Japanese boys in the age span of 9-14 years. Nayeli Macius et al. in 2007 developed and cross validated the BIA prediction for 155 Mexican subjects. Besides this several other scientists such as Deurenberg in 1991, Kushner in 1992 have already been contributing in developing the BIA prediction equation either for different ethnicities or for people of particular age group. And they have been using multiple regression technique to do so. ME Valencia et.al in 2003 determine the body composition of subjects from Cuba, Chile and Mexico. S. Going et.al in 2009 validated the use of bioelectrical impedance analysis (BIA) for estimation of body composition in Black, White and Hispanic adolescent girls. A lot of research has been undertaken by various scientists to develop prediction equation for cohorts of individual belonging to different ethnic groups, age groups, different sex and according to their level of physical activeness and the research in this field is still in progress. Some of the major researches in this field have been done in developing prediction equations for American Indians, Asians, and Srilankans, Chinese and Singaporean subjects. To the best of our knowledge there were no published height weight prediction equations validated on Indian subjects. The purpose of the study was therefore to develop sex combined prediction equation for TBW and FFM at different frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz for Indian subjects through careful analysis of data.

2.2 Subjects and Procedure:

Human Body Composition data of 100 subjects (49males and 51 females) within the age group of 23 yrs to 50 yrs were studied through Maltron-II Body Composition Impedance Analyzer method; where excitation current of 800µA at different frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz were applied to the source or drive distal electrodes on the hand and foot; and the voltage drop due to impedance is detected by sensor electrodes on the wrist and ankle. These human Body composition data were then utilized to calculate the Impedance Index i.e. (height^2/impedance) at different frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz. The calculated impedance index of each individual at different frequency is formulated in the form of Table (1). Finally multiple regression

analysis of these data was carried out to develop and design a linear model with the help of R software (version 2.9.2), taking Impedance Index, weight, sex, height and age as independent variable and TBW and FFM as dependent variables. To predict TBW and FFM at different frequencies, an algorithm was developed and statistical analysis of the data was done; the flow chart showing the actual process carried out to generate the linear model and Descriptive statistics is shown below in fig. (1) and Table (1) respectively.

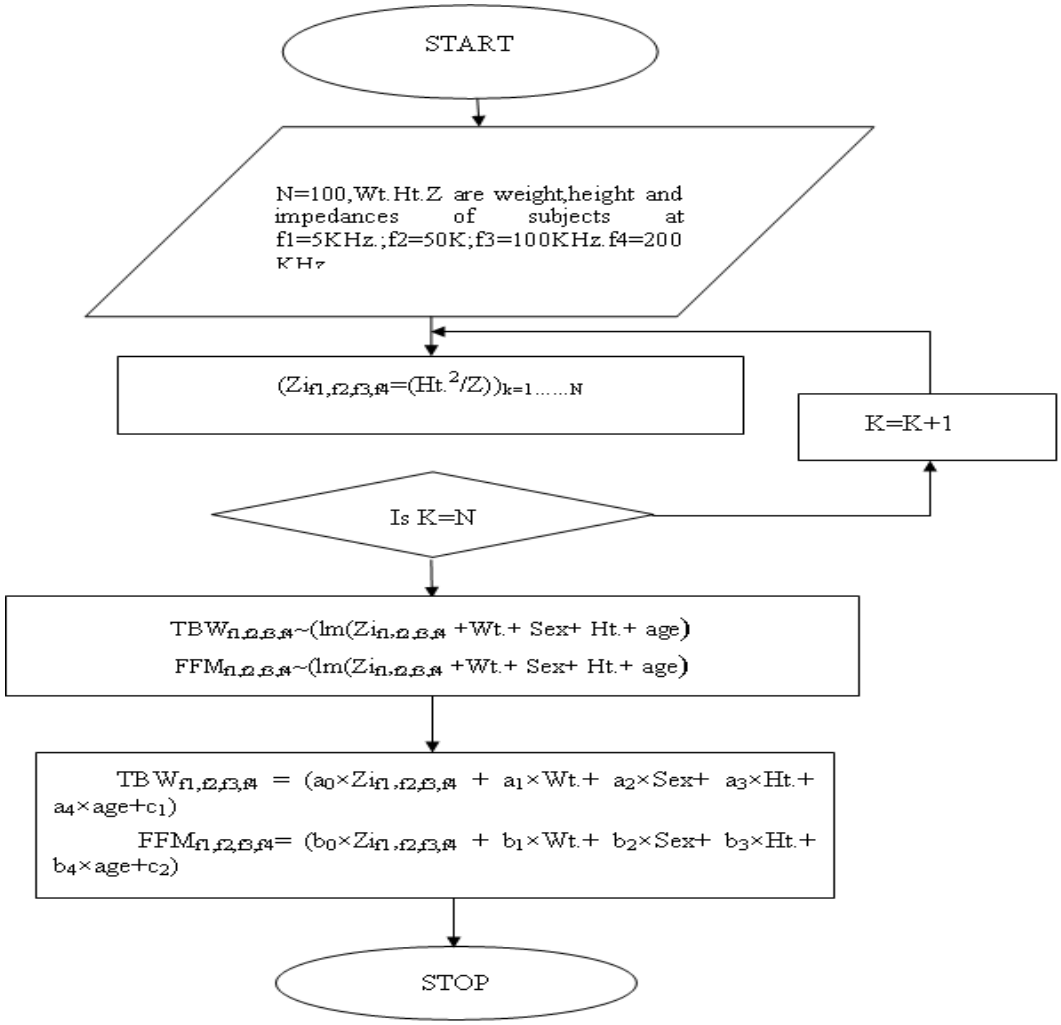


Fig1: Flowchart showing the general process to develop linear model of TBW and FFM at the frequencies of 5 KHz, 50 KHz, 100 KHz and 200KHz

Table1: Descriptive statistics of Indian Subjects (n=100)

Variables	Mean ± S.D.
TBW	30.19130 ± 6.1147635
FFM	44.81100 ± 8.4755007
Weight	56.31560 ± 10.9202889
Sex	49 males and 51 females
Height	163.72000 ± 8.1365617
Age	20.76000 ± 4.7399442
Zi at 5 KHz	34.04617 ± 7.1236521
Zi at 50 KHz	38.36969 ± 8.8680447
Zi at 100 KHz	40.74625 ± 9.5384717
Zi at 200 KHz	41.86337 ± 10.4356058

TBW = Total Body Water, FFM = Fat Free Mass, Zi at 5 KHz, Zi at 50 KHz, Zi at 100 KHz and Zi at 200 KHz are Impedance Index i.e.(height^2/Impedance) at 5KHz, 50 KHz, 100KHz and 200 KHz respectively.

2.3 Prediction Equation developed:

The obtained equations are of the form:

$$TBW\ (f_1, f_2, f_3, f_4) = a_0 \times Zi\ (f_1, f_2, f_3, f_4) + a_1 \times Wt. + a_2 \times sex + a_3 \times ht. + a_4 \times age + c_{1(f1,f2,f3,f4)} \quad \ldots.(1)$$

$$FFM\ (f_1, f_2, f_3, f_4) = b_0 \times Zi\ (f_1, f_2, f_3, f_4) + b_1 \times Wt. + b_2 \times sex + b_3 \times ht. + b_4 \times age + c_{2(f1,f2,f3,f4)} \quad \ldots.(2)$$

where $TBW_{(f1,f2,f3,f4)}$ and $FFM_{(f1,f2,f3,f4)}$ is Total Body Water and Fat Free Mass at frequencies f_1=5KHz.,f_2=50KHz.,f_3=100KHz.,f_4=200KHz. and $Z_{I(f1,f2,f3,f4)}$ is the calculated Impedance index i.e. (height^2/impedance) of the subjects at these frequencies, $c_{1(f1,f2,f3,f4)}$ and $c_{2(f1,f2,f3,f4)}$ are intercepts of equation (1) and (2) respectively, a_0, b_0 are coefficients multiplied by Impedance index(Z_I)variable; a_1, b_1 are coefficients multiplied by variable dry weight (Wt.) of the subjects measured in Kg, a_2, b_2 are coefficients multiplied by variable sex of the subjects whose value is taken as 1 for female subjects and 0 for male subjects, a_3, b_3 are coefficients multiplied by variable height (ht.) of the subjects measured in cm, a_4, b_4 are coefficients multiplied by variable age of the subjects in years.

III. RESULTS AND DISCUSSION

The study was able to develop BIA prediction equation for Indian subjects. Data used in commercial software provided 8 BIA equations; 4 for TBW and 4 for FFM at frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz. The prediction equations developed for Total Body Water at 5 KHz, 50 KHz, 100 KHz and 200 KHz are as shown below:

$TBW(5KHz) = 0.2784713 \times Zi_{5kHz} + 0.2228589 \times Wt. + 5.258763 \times sex - 0.12625 \times Ht. + 0.0007028 \times age + 26.3271409 \ldots\ldots\ldots(1)$

$TBW(50KHz) = 0.300527 \times Zi_{50\ kHz} + 0.217007 \times Wt. + 3.443507 \times sex - 0.01367 \times Ht. + 0.002274 \times age + 7.374513 \ldots\ldots..(2)$

$TBW(100\ KHz) = 0.260753 \times Zi_{100\ kHz} + 0.186436 \times Wt. + 3.90009 \times sex - 0.023725 \times Ht. + 0.004265 \times age + 11.341107 \ldots.(3)$

$TBW(200\ KHz) = 0.251182 \times Zi_{200\ kHz} + 0.216456 \times Wt. + 3.13538 \times sex - 0.01367 \times Ht. + 0.009393 \times age + 4.709239 \ldots.(4)$

In a similar pattern the prediction equation for FFM were developed at different frequencies. The predicted equations for FFM at different frequencies are as shown below:

$FFM\ (5KHz) = 0.34197 \times Zi_{5kHz} + 0.19228 \times Wt. + 5.4558 \times sex + 0.13915 \times Ht. - 0.10942 \times age - 0.2449 \ldots.(5)$

$FFM\ (50\ KHz) = 0.32512 \times Zi_{50\ kHz} + 0.19236 \times Wt. + 3.72059 \times sex + 0.26099 \times Ht. - 0.10984 \times age - 19.83645 \ldots.(6)$

$FFM\ (100\ KHz) = 0.26775 \times Zi_{100\ kHz} + 0.1637 \times Wt. + 4.37531 \times sex + 0.24449 \times Ht. - 0.10869 \times age - 14.37819 \ldots.(7)$

$FFM\ (200\ KHz) = 0.24582 \times Zi_{200\ kHz} + 0.19695 \times Wt. + 3.7678 \times sex + 0.27351 \times Ht. - 0.12292 \times age - 19.84588 \ldots.(8)$

where TBW(5 KHz), TBW(50 KHz), TBW(100 KHz) and TBW(200 KHz) is Total Body water of body in litres at5 KHz,50 KHz,100 KHz and 200 KHz frequency respectively, FFM(5 KHz), FFM(50 KHz), FFM(100 KHz) and FFM(200 KHz) is Fat Free mass of body in Kg at5 KHz,50 KHz,100 KHz and 200 KHz frequency respectively $ZI_{5\ kHz}$, $Zi_{50\ kHz}$,$Zi_{100\ kHz}$ $Zi_{200\ kHz}$ is Impedance index of body at 5KHz , KHz,50 KHz,100 KHz and 200 KHz frequency respectively in (cm^2/Ω). Value of sex of the subject is taken as 1 for female and 0 for male subject.Wt.is the weight of the body in Kg. and age is the age of subjects in years. Besides, development of BIA equations; statistical analysis of the data of data was also done the results of which were tabulated in table (3).In addition to this graphical analysis of the data is shown in Fig (2), Fig (3), Fig (4), Fig (5), Fig (6), Fig (7), Fig (8), Fig (9), Fig (10) and Fig (11). These figures showed different graphical plots such as scatter matrix plot for Total Body Water(TBW) and Fat free Mass (FFM) at different frequencies, normal distribution of standardized residuals, Scale location plot, Residual verses leverage plot and standardized residual verses cook's distance plot. These plots for linear model objects give the diagnostic information about the linear model. Besides this, a comparative study of their measured and predicted Total Body Water (TBW) and Fat Free Mass (FFM) at the frequencies of 5 KHz, 50KHz, 100KHz and 200 KHz is tabulated in Table (4) and from the results it is observed that the predicted value of TBW and FFM at these frequencies are very much closer to the measured.

Table 2: Descriptive statistics of Indian subjects (n=100) together with BIA equations developed.

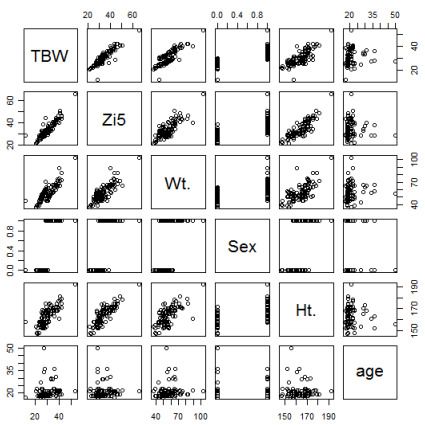
S.No..	Prediction equation developed.	Frequency used	Standard Error	Residual Error	Multiple R^2	Adjusted R^2
1.	TBW=0.314608×Zi+ 0.212291×Wt.+ 4.257354×sex- 0.009882×Ht.+ 0.039560×age+ 6.235368	5KHz	Intercept = 5.963570 Zi=0.065911 Wt.=0.030001 sex = 0.522615 Ht.=0.043147 age=0.039780	1.814 on 94 df	0.9165	0.912
2.	TBW = 0.290745×Zi + 0.2005097×Wt.+ 3.5597989×sex- 0.0006424×Ht.+ 0.0428386×age+ 5.0120239	50 KHz	Intercept = 5.857987 Zi=0.0529511 Wt.=0.0292819 sex = 0.5587226 Ht.=0.0397139 Age=0.0386036	1.759 on 94 df	0.9214	0.9172
3.	TBW = 0.2842034×Zi + 0.1922181×Wt.+ 3.3742453×sex- 0.0007968×Ht.+ 0.0524735×age+ 4.9240305	100 KHz	Intercept = 5.4772394 Zi=0.0490874 Wt.=0.0293544 sex=0.5627913 Ht.=0.0388512 age=0.0382678	1.736 on 94 df	0.9235	0.9194
4.	TBW = 0.18465×Zi + 0.22838×Wt.+ 3.82975×sex- 0.03285×Ht.+ 0.02245×age+ 1.8813	200 KHz	Intercept = 5.86617 Zi= 0.04563 Wt.=0.03014 sex=0.60795 Ht.=0.04101 age=0.04075	1.866 on 94 df	0.9116	0.9069
5.	FFM=0.45323×Zi+0.31139×Wt. + 2.27034×sex+0.16446×Ht.- 0.06293×age- 14.88628	5KHz	Intercept = 7.31313 Zi=0.08083 Wt.=0.036979 sex= 0.64088 Ht.=0.05291 age=0.04878	2.224 on 94 df	0.9346	0.9311
6.	FFM=0.40732×Zi+0.30335×Wt. + 1.15068×sex+0.18640×Ht.- 0.05924×age- 17.75259	50 KHz	Intercept = 6.7125 Zi=0.6252 Wt.=0.03469 sex =0.6878	2.133 on 94 df	0.9399	0.9367

			Ht.=0.04769 age=0.04679	2.104 on 94 df		
7.	FFM=0.40581×Zi+0.28364×Wt. + 1.07507×sex+0.17998×Ht.-0.05651×age- 16.51783	100 KHz	Intercept = 6.6650 Zi=0.05975 Wt.=0.0357 sex= 0.67785 Ht.=0.04722 age=0.04619	2.375 on 94 df	0.9415	0.9384
8.	FFM=0.23182×Zi+0.34806×Wt. + 1.91612×sex+0.23878×Ht.-0.08744×age -22.71149	200 KHz	Intercept = 7.46481 Zi= 0.05799 Wt.= 0.03831 sex=0.77485 Ht.=0.05219 age=0.05188		0.9254	0.9215

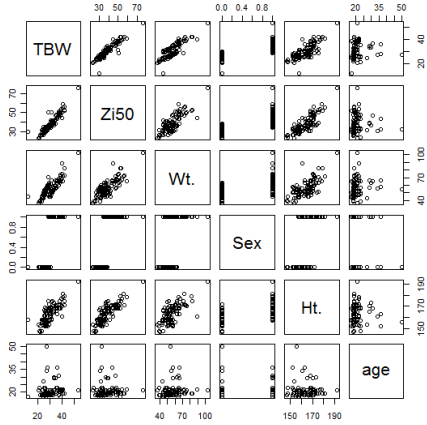
Table 3: Comparative study of measured and predicted value of TBW and FFM at different frequencies of participants for N= 10 out of 100 data

S.No.	TBW predicted at 5KHz.	TBW predicted at 50KHz	TBW predicted at 100 KHz	TBW predicted at 200 KHz	TBW measured	FFM predicted at 5KHz	FFM predicted at 50 KHz	FFM predicted at 100 KHz	FFM predicted at 200 KHz	FFM measured
1.	30.377	27.427	27.69	22.253	26.95	37.652	38.128	38.176	37.547	36.57
2.	36.565	36.433	36.556	25.602	36.9	51.626	51.656	51.858	51.620	51.97
3.	36.159	35.843	35.898	25.223	35.81	49.555	49.319	49.364	49.226	49.47
4.	32.568	32.726	32.904	22.392	33.16	45.527	45.960	46.289	46.491	47.34
5.	35.058	33.214	33.081	22.669	33.33	50.457	48.156	47.913	49.331	50
6.	26.821	26.605	26.801	16.412	26.99	39.787	39.842	39.922	40.084	39.26
7.	27.492	27.539	27.774	17.765	27.92	38.918	39.283	39.439	39.166	37.52
8.	34.694	34.184	34.221	19.845	34.46	49.533	49.141	48.481	50.053	50.52
9.	25.251	25.206	25.881	18.561	25.43	38.089	37.562	38.403	37.666	38.73
10.	32.660	23.990	23.375	17.604	24.54	35.082	35.456	34.571	34.875	36.41

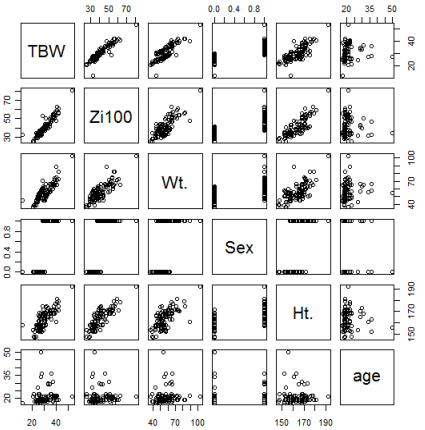
Fig.2: Scatter Plot Matrix distribution of body composition of Indian subjects; showing the relationship between Total Body Water(TBW) in liters, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz,50KHz,100KHz and 200KHz in (cm^2/Ω) and Weight of body in Kg, sex, height of the body in cm and age of the individual in years.



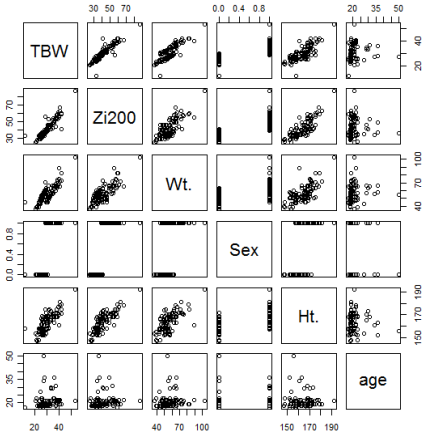
(a)



(b)

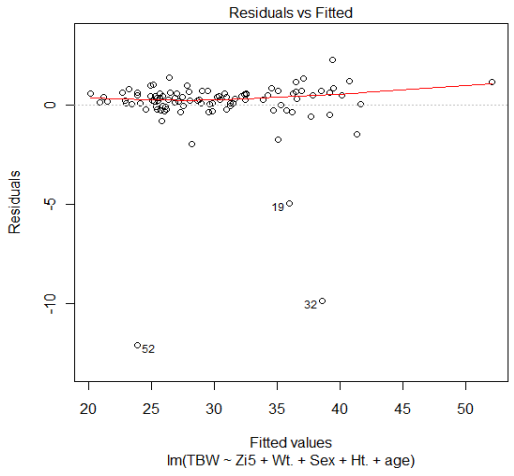


(c)

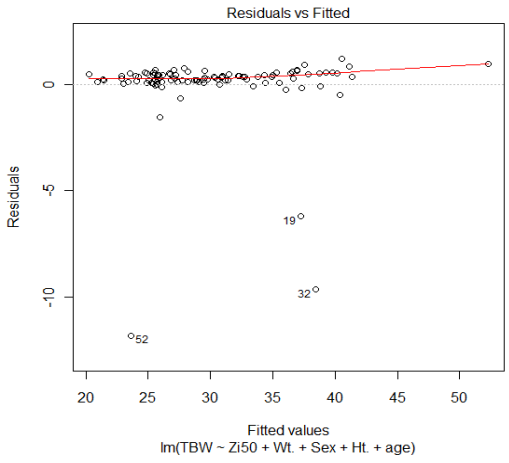


(d)

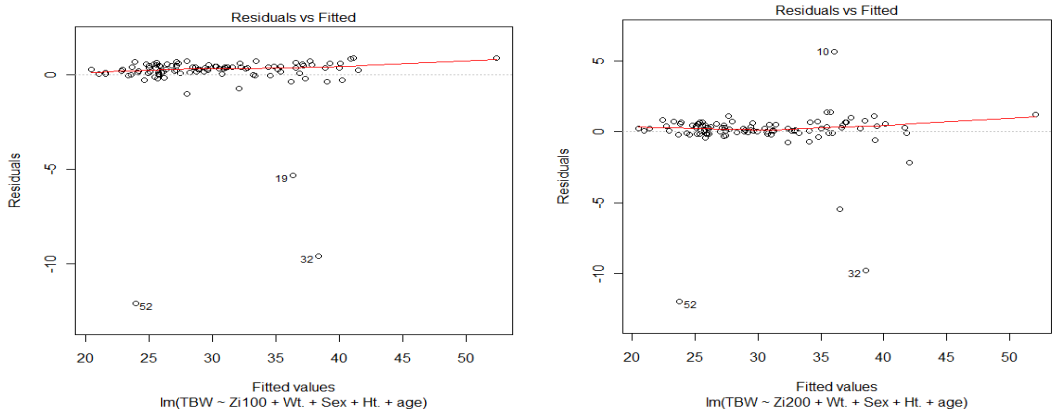
Fig3: Random scatter distribution of residual versus fitted values of Indian subjects showing the relationship between Total Body Water (TBW) in liters, Impedance Index (Height^2/Impedance) of body at 5KHz, 50KHz,100KHz and 200KHz frequency in (cm^2/Ω) and Weight of body in Kg, sex, height of the body in cm and age of the individual in years.



(a)

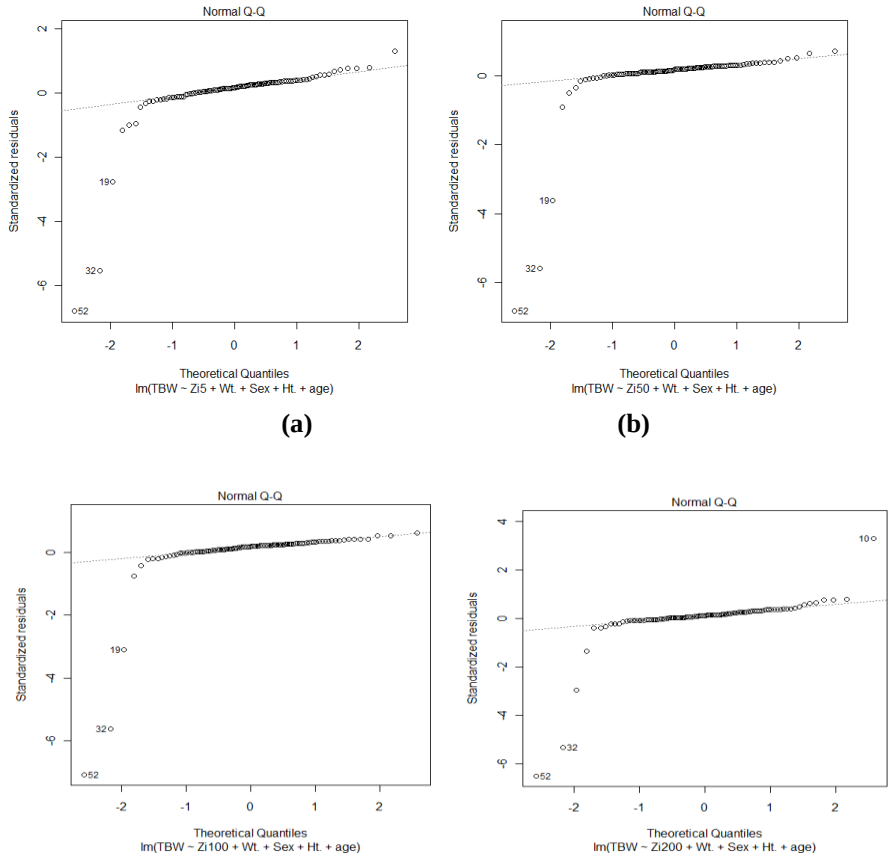


(b)



(c) **(d)**

Fig.4: Normal distribution versus Standardized residuals of Indian subjects showing the relationship between Total Body Water (TBW) in liters, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz,50KHz,100KHz and 200KHz.in (cm^2/Ω) and Weight of body(Kg), sex, height of the body in cm and age of the individual in years.



(a) **(b)**

(c) **(d)**

Fig5: Scale location plot between the square root of standardized residuals versus fitted values of Indian subjects showing the relationship between Total Body Water (TBW) in liters, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz, 50KHz, 100KHz and 200KHz.in (cm^2/Ω) and Weight of body(Kg), sex, height of the body in cm and age of the individual in years.

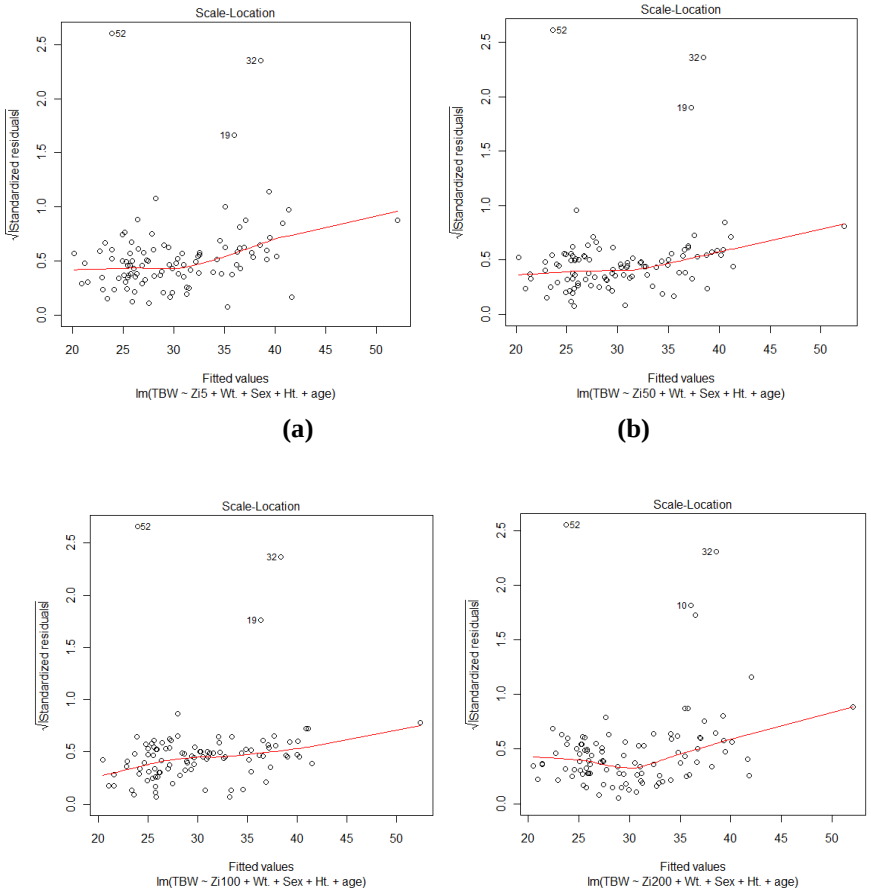
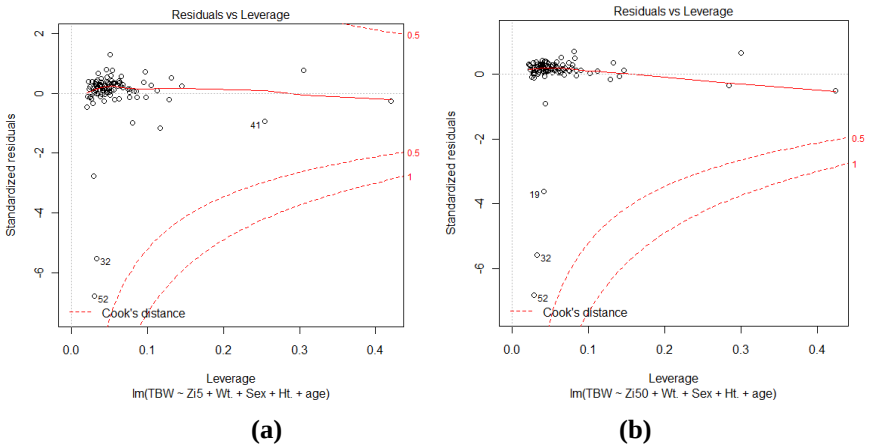
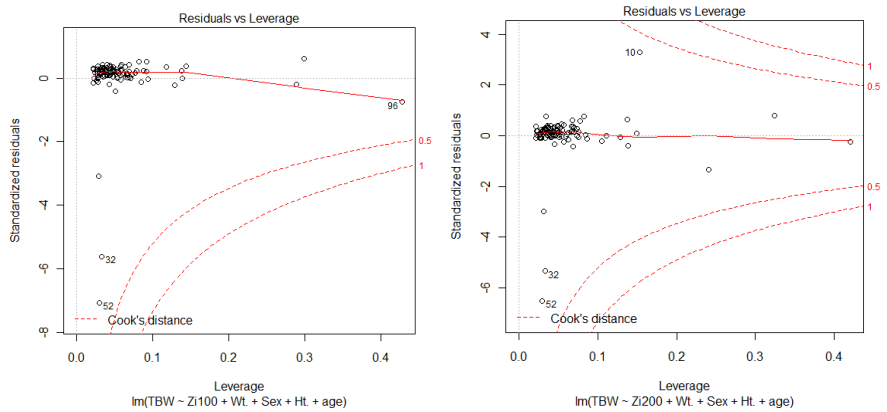


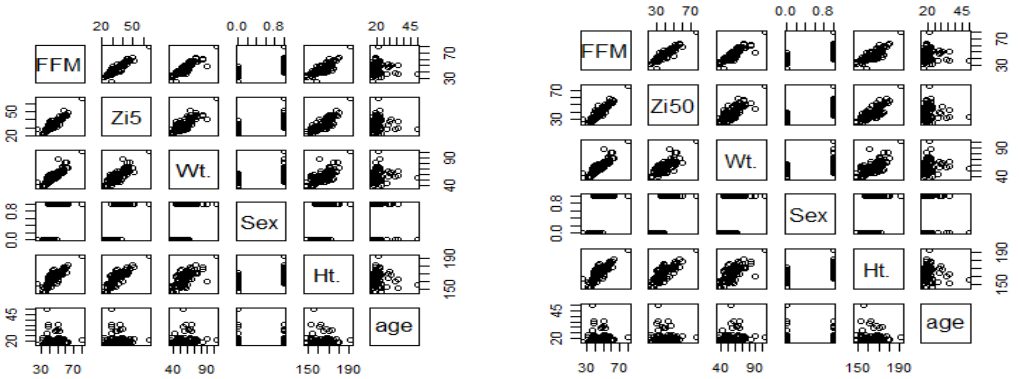
Fig6: Residual versus leverage plot and standardized residuals verses cook's distance plot of Indian subjects showing the relationship between Total Body Water (TBW) in liters, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz, 50KHz, 100KHz and 200KHz.in (cm^2/Ω) and Weight of body(Kg), sex, height of the body in cm and age of the individual in years.



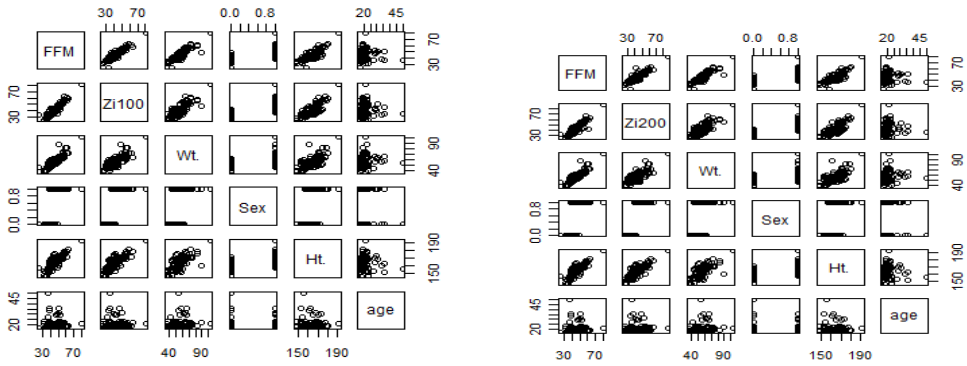


(c) **(d)**

Fig.7: Scatter Plot Matrix distribution of body composition of Indian subjects; showing the relationship between Fat Free Mass (FFM) in (Kg), Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz,50KHz,100KHz and 200KHz in (cm^2/Ω) and Weight of body in Kg, sex, height of the body in cm and age of the individual in years.



(a) **(b)**



(c) **(d)**

Fig8: Random scatter distribution of residual versus fitted values of Indian subjects showing the relationship between Fat Free Mass (FFM) in Kg, Impedance Index (Height^2/Impedance) of body at 5KHz, 50KHz,100KHz and 200KHz frequency in (cm^2/Ω) and Weight of body in Kg, sex, height of the body in cm and age of the individual in years.

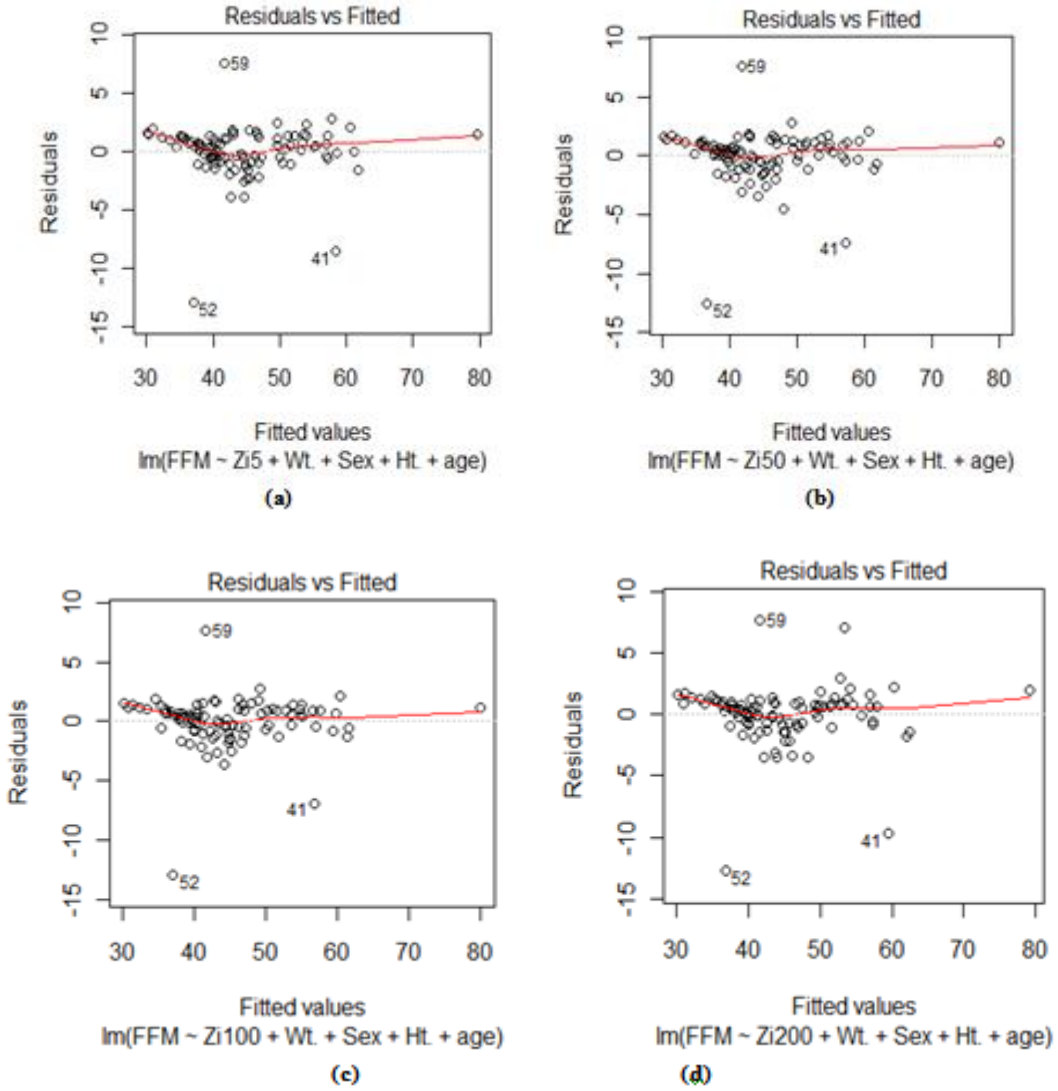
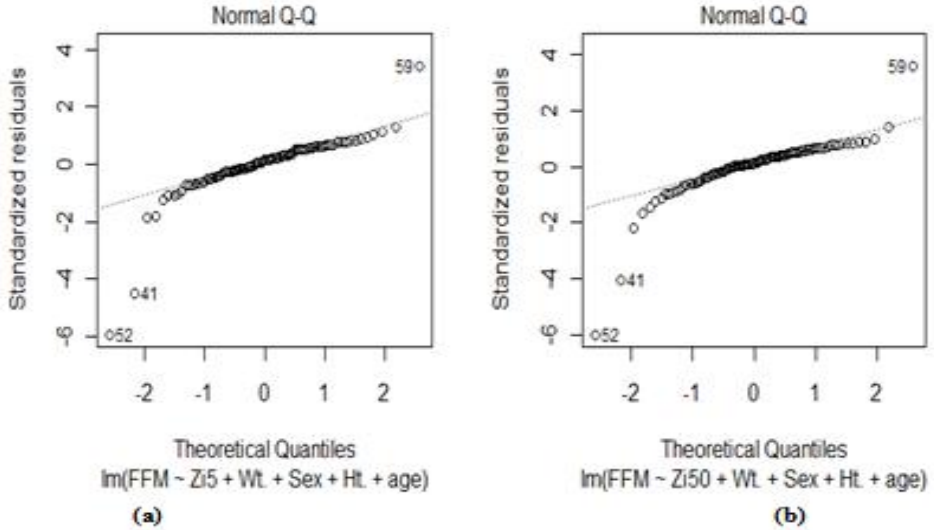


Fig.9: Normal distribution versus Standardized residuals of Indian subjects showing the relationship between Fat Free Mass (FFM) in Kg, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz,50KHz,100KHz and 200KHz.in (cm^2/Ω) and Weight of body in Kg, sex, height of the body in cm and age of the individual in years.



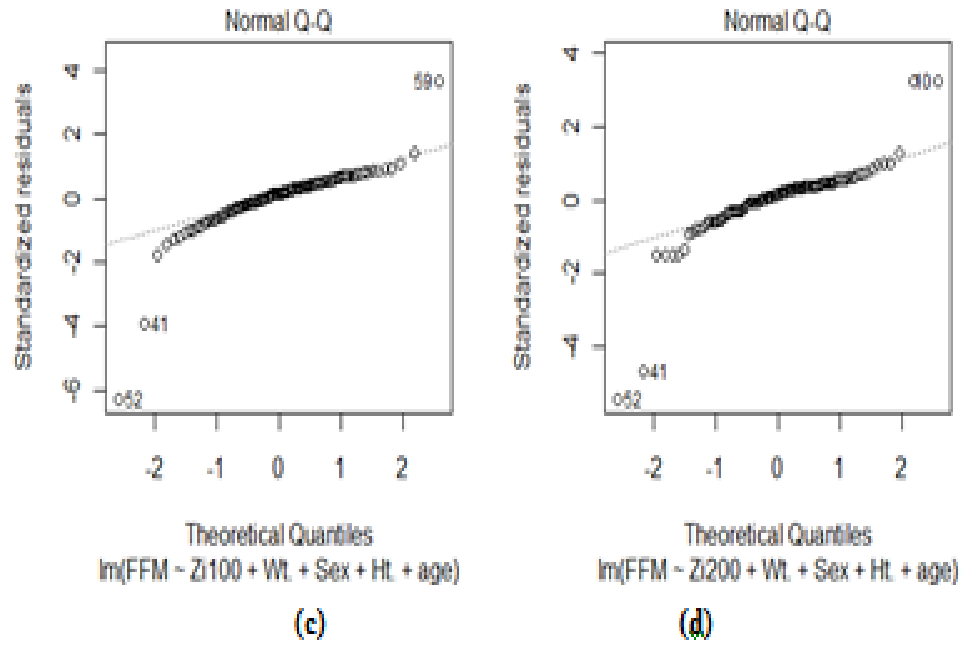
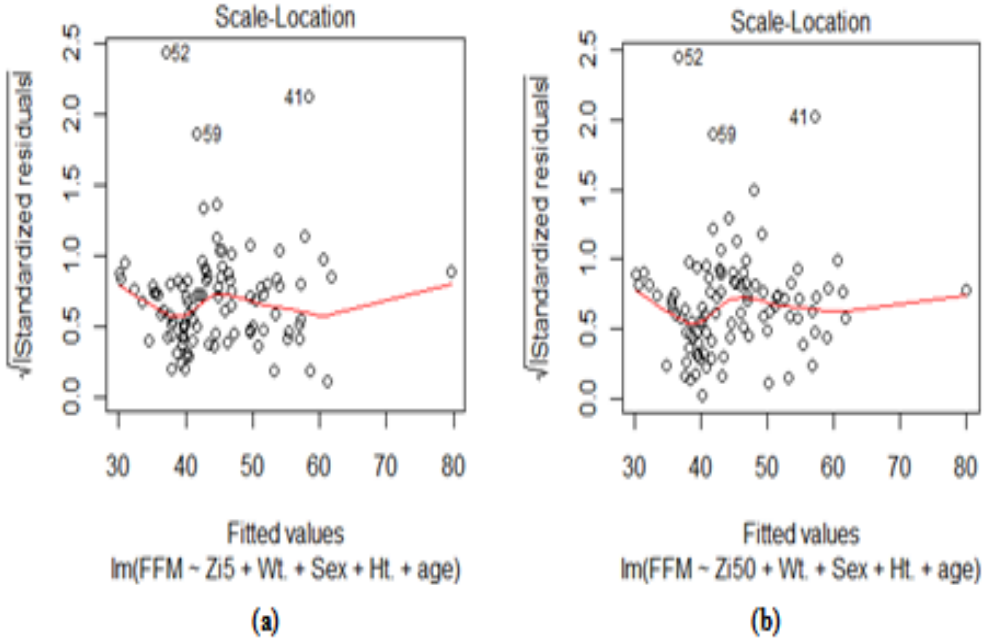


Fig10: Scale location plot between the square root of standardized residuals versus fitted values of Indian subjects showing the relationship between Fat Free Mass (FFM) in Kg, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz, 50KHz, 100KHz and 200KHz.in (cm^2/Ω) and Weight of body(Kg), sex, height of the body in cm and age of the individual in years.



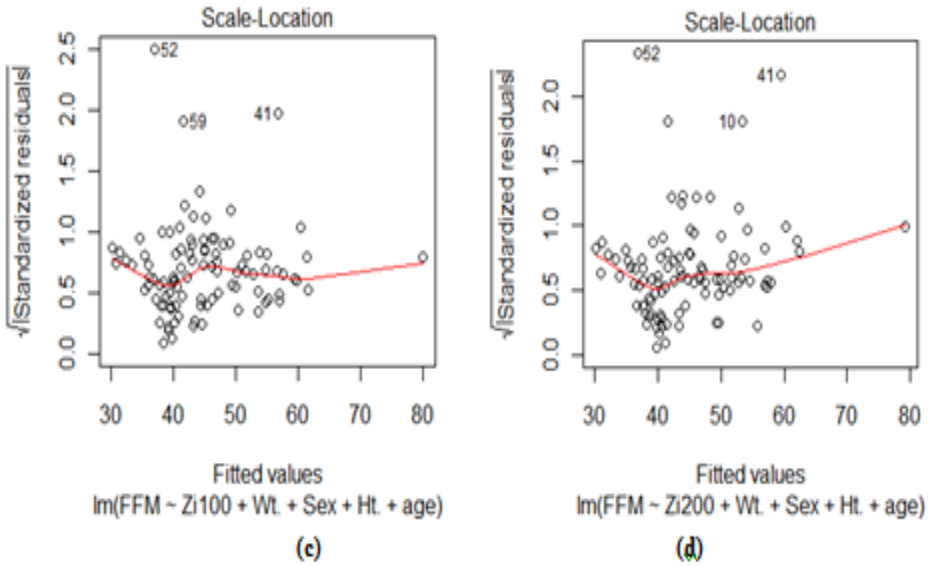
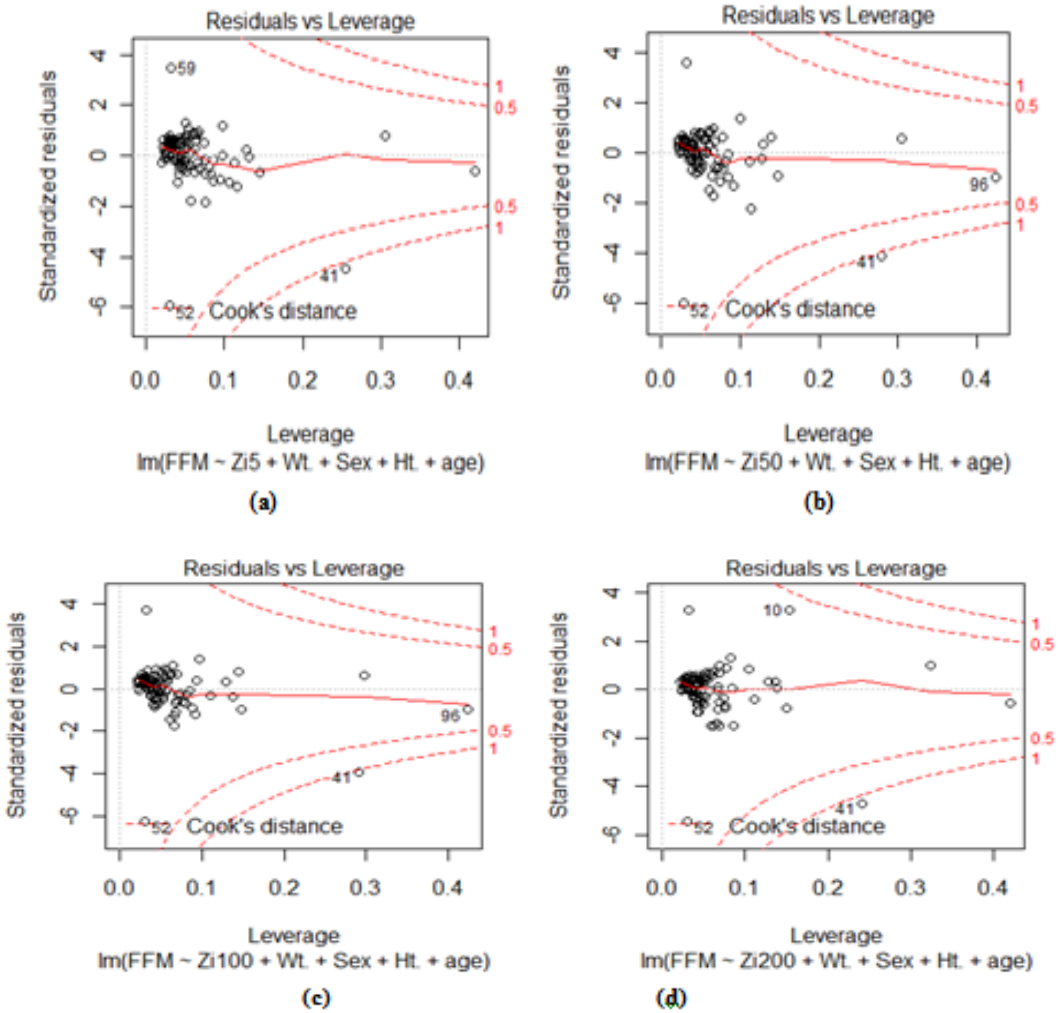


Fig11: Residual versus leverage plot and standardized residuals verses cook's distance plot of Indian subjects showing the relationship between Fat Free Mass (FFM) in Kg, Impedance Index (Height^2/Impedance) of body at frequencies of 5KHz, 50KHz, 100KHz and 200KHz.in (cm^2/Ω) and Weight of body(Kg), sex, height of the body in cm and age of the individual in years.



IV CONCLUSION:

The body composition parameters of the samples (100 subjects) measured through instrument Maltron-II Body Composition Impedance Analyzer at frequencies of 5 KHz, 50 KHz, 100 KHz and 200 KHz were utilized to obtain BIA equations. To do the same; multiple regression analysis was carried out on clinical data through R (2.9.2) software. The instrument has many advantages over the analysis of body composition through other methods and is safe, rapid, portable, easy to perform and require minimum operator training. The BIA prediction equation for Total Body water and Fat Free mass was developed at different frequencies. These prediction equation developed in the present paper is the first BIA prediction equation for TBW and FFM for Indian subjects. The predicted TBW and FFM of each individual are very close to the one measured through instrument. The results shows that the predicted values of TBW and FFM are very much closer to the one measured through the instrument. However, it is observed that at higher frequencies the results are much closer to the measured value. This is due to the fact that at low frequencies, the current cannot bridge the cellular membrane and will pass predominantly through the extracellular space, whereas at higher frequencies penetration of the cell membrane occurs and the current is conducted by both the extra-cellular water (ECW) and intra-cellular water (ICW). Based on these BIA equations, a general idea about the dietary habits of Indian subjects can be predicted which can be utilized for variety of clinical and research applications; as information about lean tissue mass, fat tissue mass, and fractional contribution of fat makes them excellent for monitoring pharmaceutical therapy, nutritional or exercise intervention, sports training &/or other body composition altering programs. Besides this, the information regarding the dietary habits of Indian subjects will give the pharmaceutical companies a chance to explore the change in body composition of Indian subjects before and after drug therapy. It will also provide coaches and researchers, the initial information regarding the general trends in the health status of Indian subjects so that they can formulate individualized training program and provide them with information about the suitable energy needs of the body so that they can achieve desirable body weight and composition.

ACKNOWLEDGEMENTS:

The authors express their sincere gratitude to all those participants who participated in the analysis of their body composition, otherwise; without their cooperation this study would not have been possible. In addition to this; authors would like to mention the helpful guidance of Professor Ashok Salan from D.R.D.O. Institute New Delhi, India. Lastly, authors would like to mention that this work was done as part of the theses work of Miss Ghazala Perveen Khan under the supervision of Dr.Shabana Mehfooz and Dr. Munna Khan at Jamia Millia Islamia University, New Delhi.

Author for correspondence: Khan GP, Jamia Millia Islamia University, Department of Electrical Engineering, New Delhi – 110025

REFERENCES

[1] Basile C, Vernaglione L, Di Iorio B, Bellizzi V, Chimienti V, Lomonte C, Rubino A, and D'Ambrosio N. Development and Validation of Bioimpedance Analysis Prediction Equations for Dry Weight in Hemodialysis Patients. Clin J Am Soc Nephrol 2: pp:675-680, 2007

[2] Biradar RR. Status of human health in India: Emerging issues in the era of globalization. Submitted for presentation of XXV international population conference international union of scientific study on population 2005, France.

[3] Cameron NI, Griffiths PL, Wright MM, Blencowe C, Davis NC, Pettifor JM, and Norris SA. Regression equations to estimate percentage body fat in African prepubertal children aged 9. Am J Clin Nutr 2004, Vol. 80, No. 1,pp: 70-75, July 2004 .

[4] Desport JC, Preux PM, Demange CB, Clavelou P, Beaufrere B, Bonnet C, and Couratier PP.Validation of bioelectrical impedence analysis in patients with amyotrophic lateral sclerosis.The Amarican Juornal of Clinical Nutrition (2003). Vol-77,No.5:1179-1185.

[5] Deurenberg P, Deurenberg YM, Foo LF, Schmidt G and Wang J. Differences in body composition between Singapore Chinese, Beijing Chinese and Dutch children. European Journal of Clinical Nutrition (2003). Vol- 57:pp:405-409.

[6] Deurenberg P, Van der Kooy K, Leenen R, Weststrate JA, Seidell JC. Sex and age specific prediction formulas for estimating body composition from bioelectrical impedence: a cross-validation study. Int J Obes 1991;15:17-25

[7] Going S, Nichols J, Loftin M, Stewart D, Lohman T, Tuuri G, Ring K, Pickrel J, Blew R and Stevens J.Validation of bioelectrical impedance analysis (BIA) for estimation of body composition in Black, White and Hispanic adolescent girls:International Journal of Body Composition Research, 2006 ; Vol-4(4): 161–167.

[8] Goswami PN.Thesis under the supervision of Dr. Munna Khan ;Prediction and measurement of Human Body composition using Non-Invasive technique;2010.

[9] Haas VK, Allen JR, Kohn MR, Clarke SD, Zhang S, Briody JN, Gruca M, Madden S, Müller MJ, Gaskin KJ. Total body protein in healthy adolescent girls: validation of estimates derived from simpler measures with neutron activation analysis. The American Journal of Clinical Nutrition (2007). Vol-85(1):pp-66-72

[10] Heyward VH, Wagner DR. .Applied Body Composition, 2nd Edition.Champain, IL: Human Kinetics, 2004

[11] Khan M, Reggie OH, Pohlman RL, Goldstein DB, Guha S.K. Multi-Dimension Applications of Bioelectrical Impedance Analysis. International Journal of Exercise Physiology (Online) 2005; February 8(1): 56-71.

[12] Kim, H.K., Tanaka, K., Nakadomo, F., and Watanabe, K. Fat-Free mass in Japanese boys predicted from Bioelectrical Impedance and anthropometric variables,1994. European Journal of Clinical Nutrition Vol-48,482-489.

[13] Kushner, R.F. Bioelectrical Impedance Analysis: A review of principles and applications, 1992. Journal of the American College of Nutrition Vol-11:199-209

[14] Kushner RF, Schoeller DA. Estimation of body water by bioelectrical impedence analysis. Am J Clin Nutr 1986;44:417-24.

[15] Macias N, Alemán-Mateo H, Esparza-Romero J and Valencia ME Body fat measurement by bioelectrical impedance and air displacement plethysmography: a cross-validation study to design bioelectrical impedance equations in Mexican adults,2007. Nutrition Journal doi:10.1186/1475-2891-6-18.

[16] Moon JR, Hull HR, Tobkin SE, Teramoto M, Karabulut1M, Roberts MD, Ryan ED, Kim SJ, Dalbo VJ, Walter AA, Smith AT, Cramer JT and Stout JR. Percent body fat estimations in college women using field and laboratory methods: a three-compartment model approach. Journal of the International Society of Sports Nutrition 2007,doi:10.1186/1550-2783, pp:4-16

[17] Nyboer J. Percent body fat by four terminal bio-electrical impedance and body density in college freshmen. Proceedings of the V International Conference on Electrical Bio-impedance 1981, Tokyo.,Vol-8,pp:56-71.

[18] Ritchie CB and Davidson RT Regional body composition in college-aged Caucasians from anthropometric measures, Nutrition & Metabolism 2007, doi:10.1186/1743-7075,pp:4-29

[19] Segal KR. Van Loan M, Fitzgerald PI, Hodgdon JA, Van Itallie TB. Lean body mass estimation by bioelectrical impedence analysis:a four site cross validation study.Am J Clin Nutr 1988;47:7-14.

[20] Shah AH and Bilal R; Body composition, its Significance and model for assessment:Pakistan Journal of Nutrition 2009.Vol-2,pp:198-202.

[21] Sun SS, Chumlea WC, Heymsfield SB, Lukaski HC, Schoeller D, Friedl K, Kuczmarski RJ, Flegal KM, Johnson CL & Hubbard Van S (2003) Development of bioelectrical impedance analysis prediction equations for body composition with the use of a multicomponent model for use in epidemiological suerveys,Vol-77,pp:331-340.

[22] Troiano RP, Flegal KM, Kuczmarski RJ. Overweight prevalence and trends for children and adolescents: The National Health and Nutrition Examination Surveys, 1963 to1991. Arch Pediatr Adolesc Med 1995; Vol-149:1085–91

[23] Valencia ME, Aleman-Mateo H, Salazar G, Triana MH.Body composition by hydrometry (deuterium oxide dilution) and Bioelectrical Impedance in subjects aged>60 years from rural regions of Cuba, Chile and Mexico: International Journal of Obesity,2003; Vol-27:848-855.

[24] Wabitsch M, Braun U, Heinze E, Muche R, Mayer H, Teller W, Fusch C. Body composition in 5-18-y-old obese children and adolescents before and after weight reduction as assessed by deuterium dilution and bioelectrical impedance analysis:American Journal of Clinical Nutrition,1996; Vol- 64(1): 1-6.

Time Division Multiple Access in Clustered Wireless Networks

Srinivas.S[1], M.Shashikala[2]

[1]*m.Tech In Cse Dept ,Sr Engineering College,Warangal, Andhra Pradesh, India*
[2]*assistant Professor In Cse Dept, Sr Engineering College, Warangal, Andhra Pradesh, India*

ABSTRACT

Time division multiple access (TDMA) is a channel access method for shared medium networks. It allows several users to share the same frequency channel by dividing the signal into different time slots. The users transmit in rapid succession, one after the other, each using its own time slot. This allows multiple stations to share the same transmission medium (e.g. radio frequency channel) while using only a part of its channel capacity. Based on the network-wide flow distribution calculated from the optimization model and transmission power on every link, we then propose an algorithm for deriving the TDMA schedules, utilizing the slot reuse concept to achieve minimum TDMA frame length. Numerical results reveal that our proposed solution reduces the energy consumption *and delay significantly, while simultaneously satisfying a specified reliability objective.*

KEY WORDS*: Wireless Sensor Networks (WSN), TDMA*

I. INTRODUCTION

TDMA is a type of Time-division multiplexing, with the special point that instead of having one transmitter connected to one receiver, there are multiple transmitters. In the case of the uplink from a mobile phone to a base station this becomes particularly difficult because the mobile phone can move around and vary the timing advance required to make its transmission match the gap in transmission from its peers.

TDMA characteristics

- Shares single carrier frequency with multiple users
- Non-continuous transmission makes handoff simpler
- Slots can be assigned on demand in dynamic TDMA
- Less stringent power control than CDMA due to reduced intra cell interference
- Higher synchronization overhead than CDMA
- Advanced equalization may be necessary for high data rates if the channel is "frequency selective" and creates Intersymbol interference
- Cell breathing (borrowing resources from adjacent cells) is more complicated than in CDMA
- Frequency/slot allocation complexity
- Pulsating power envelope: Interference with other devices

In the seven-layer OSI model of computer networking, media access control (MAC) data communication protocol is a sublayer of the data link layer, which itself is layer 2. The MAC sublayer provides addressing and channel access control mechanisms that make it possible for several terminals or network nodes to communicate within a multiple access network that incorporates a shared medium, e.g. Ethernet. The hardware that implements the MAC is referred to as a medium access controller. The MAC sub layer acts as an interface between the logical link control (LLC) sublayer and the network's physical layer. The MAC layer emulates a full-duplex logical communication channel in a multi-point network. This channel may provide unicast, multicast or broadcast communication service.

II. RELATED WORK

The main contributions of this paper are twofold. First, we build a cross-layer nonlinear optimization model to achieve energy efficiency with specified link reliability and bandwidth constraints. Instead of solving this nonlinear optimization problem directly by heuristic algorithms, we transform the problem into two simpler

subproblems at less complexity, which facilitates the application of our approach in large-size WSNs. Second, we propose a scheduling algorithm for slot assignment in clustered WSNs. This scheduling algorithm incorporates the slot reuse concept (from cellular networks) in calculating the schedules based on the optimal flows derived from the proposed optimization model. We show that the slot reuse concept significantly reduces the end-to-end latency without a penalty in the energy efficiency.

III. SENSOR NETWORK ARCHITECTURE

3.1. NETWORK ARCHITECTURE

Our assumptions for network such as, nodes are randomly distributed over an area of 400 x 500 meters with network properties. Network is static and nodes are distributed in random format, while area is divided in equal square grid format while we consider randomly one region. There exists only one base station, which is deployed at a fixed place in the random location. The energy of nodes cannot be recharged.

3.2. CLUSTERING

The nodes in the network are divided into multiple clusters, each comprising a CH and cluster members that communicate via one hop to the CH. The clustering scheme will be used to form clusters. Using the clustering scheme presented in gateways are selected to connect neighboring CHs. A gateway is a cluster member belonging to the cluster represented by one of the CHs it connects.

3.3. MINIMUM DELAY TDMA SCHEDULING

We here propose the TDMA scheduling algorithm. The scheduling includes both intercluster and intra-cluster scheduling. The tdma scheme is to assigning slots to all links, and it contains two stages. one is to assign the link slots to links between cluster members and the CH in each cluster. another one is to assign the link slots between CHs. which is called Intra-cluster slot. Intra-cluster slot assignment is usually done by the CH. For the intra-clustering schedule, First We define a frame of length M (>1) composed of M fixed length time slots. Then we decrease the slot length to reuse the slot.

To reuse the slot we will follow three criterions. Criterion 1: Node i is not the sender or receiver of a previously scheduled link using slot s, and the link of node i to be scheduled with slot s does not have the same receiver as that of previously scheduled link using slot s. Criterion 2: scheduling s as a slot used by one of node is links causes negligible interference to the receiver of a previously scheduled link also using slot s; Criterion 3: The sender of a scheduled link using slot s causes negligible interference to current receiver if using slot s on one of node i's links. For the inter-cluster scheduling, we propose a conflict free schedule among the time slots.

IV. EXISTING SYSTEM

Existing method formulate the problem via cross-layer optimization, aiming at deriving the most energy-efficient flows on every link. This implies that an optimal transmission power exists for a link to achieve power efficiency. We can say that the optimization model achieves more power efficiency in such a WSN (for example, if assuming that a backup CH near nodes exist in this scenario), since there are more choices of selecting optimal paths toward the sink even if some nodes run out of energy. CSMA especially under medium to high traffic load the main contributions of this paper are twofold. First, we build a cross-layer nonlinear optimization model to achieve energy efficiency with specified link reliability and bandwidth constraints. Instead of solving this nonlinear optimization problem directly by heuristic algorithms, we transform the problem into two simpler sub problems at less complexity, which facilitates the application of our approach in large-size WSNs. Second, we propose a scheduling algorithm for slot assignment in clustered WSNs.

V. PROPOSED SYSTEM

We propose a solution to the scheduling problem in clustered wireless sensor networks (WSNs). The objective is to provide network-wide optimized time division multiple access (TDMA) schedules that can achieve high power efficiency, zero conflict, and reduced end-to-end delay. To achieve this objective, we first build a nonlinear cross-layer optimization model involving the network, medium access control (MAC), and physical layers, which aims at reducing the overall energy consumption. We solve this problem by transforming the model into two simpler sub problems. Based on the network-wide flow distribution calculated from the optimization model and transmission power on every link, we then propose an algorithm for deriving the TDMA schedules. We aim at deriving TDMA schedules with optimized power consumption and minimum latency in clustered WSNs. Energy efficiency is a major concern in WSNs. To achieve the paper's objective, we propose a two-step approach to derive TDMA schedules supporting both high energy efficiency and minimum delay in WSNs. In the first step, we formulate the problem via cross-layer optimization, aiming at deriving the most

energy-efficient flows on every link. Based on the calculated per-link flows, in the second step, we propose an algorithm to obtain a TDMA schedule with the least frame length. From the analysis presented least frame length guarantees minimum delay for the derived TDMA schedules. TDMA scheduling transmission power and retransmissions on a link determining the optimal transmission power, we build a cross-layer design-based nonlinear optimization model which aims at minimizing the network-wide energy consumption. We solve this problem by transforming it into two sub problems with less complexity.

VI. CONCLUSION

In this paper we propose a TDMA-based communication approach to be used upon the EDCA communication mechanism that is specially suited to support RT tra_c. The proposed TDMA-based approach has been assessed by simulation. The simulation scenarios consider a set of RT stations operating in the same frequency band together with a set of external STD stations. Basically, we have assessed the impact of timing unconstrained tra_c (generated by the set of STD stations) upon the behavior of the highest access category (voice). In both EDCA and TDMA models when this access category is used to transfer small sized packets in periodic intervals.

Moreover, both error-free and error-prone channels were considered. The simulation analysis shows that:
The average access delay for the TDMA mode considering both error-free and error-prone channels is kept almost constant, unlike for EDCA case. This demonstrates a desired behavior for RT applications;

Both for error-free and error-prone cases, the
TDMA functional throughput and deadline losses remains stable even with the increase of the number of RT stations, which does not occur for the EDCA case;

Both for error-free and error-prone cases, the
TDMA functional throughput is more than double when compared to the EDCA case;

Both for error-free and error-prone cases, the number of deadline losses for the TDMA case is less than half of best result for the EDCA case.

The main conclusion is that the TDMA approach keeps a stable behavior independently of the number of RT stations or the external STD load. However, the TDMA approach is able to guarantee industrial communication requirements with maximum of external
STD load of 73% in error-free channels and 47% in error-prone channels when the deadline is equal to the stream period (Di = Pi). These results significantly improve the EDCA results.

REFERENCES

[1] \ IEEE Standard for Information Technology - Part 11: Wireless Medium Access Control(MAC) and Physical Layer (PHY) Speci_cations,"2007.

[2] R. Moraes, F. Vasques, P. Portugal, and P. Souto, \A forcing collision resolution approach able to prioritize tra_c in CSMA-based networks," Computer Communications, vol. 33, no. 1, pp. 54{64, 2010.

[3] J. Son, I.-G. Lee, H.-J. Yoo, and S.-C. Park, \Ane_ective polling scheme for IEEE 802.11e," IE- ICE Transactions on Communications, vol. E88-B, no. 12, pp. 4690 { 4693, 2005.

[4] D. Gao, J. Cai, and C. W. Chen, \Admission control based on rate-variance envelop for VBR tra_c over IEEE 802.11e HCCA WLANs,"IEEE Transactions on Vehicular Technology,vol. 57, no. 3, pp. 1778{1788, May 2008.

[5] M. Ergen, D. Lee, R. Sengupta, and P. Varaiya,\WTRP-wireless token ring protocol," IEEE Transactions on Vehicular Technology, vol. 53, no. 6, pp. 1863 { 1881, 2004.

[6] R.-G. Cheng, C.-Y. Wang, L.-H. Liao, and J.-S.Yang, \Ripple: a wireless token-passing protocol for multi-hop wireless mesh networks," IEEE Communications Letters, vol. 10, no. 2, pp. 123{ 5, 2006.

[7] J. Villal_on, P. Cuenca, L. Orozco-Barbosa, and A. Garrido, \B-EDCA: A QoS mechanism for multimedia communications over heterogeneous 802.11/802.11e WLANs," Computer Communications, vol. 31, no. 17, pp. 3905{3921, 2008.

[8] A. Hamidian and U. Korner, \An enhancement to the IEEE 802.11e EDCA providing QoS guarantees," Telecommunication Systems, vol. 31, no.2-3, pp. 195 { 212, 2006.

[9] C. Wang, B. Li, and L. Li, \A new collision resolutionmechanism to enhance the performance of IEEE 802.11 DCF," IEEE Transactions on Vehicular Technology, vol. 53, no. 4, pp. 1235 {1246, 2004.

[10] E. Lopez-Aguilera, J. Casademont, J. Cotrina,and A. Rojas, \Enhancement proposal forWLAN IEEE 802.11e: Desynchronization of its working procedure," 14th IEEE Workshop on Local and Metropolitan Area Networks, pp. 1{6,2005.

[11] L. Lo Bello, F. S. Kaczynski, and O. Mirabella,\A wireless tra_c smoother for soft real-time communications over IEEE 802.11 industrialnetworks," 11th IEEE International Conferenceon Emerging Technologies and Factory Automa-tion (ETFA), pp. 1073{1079, 2006.

[12] L. Lo Bello, G. A. Kaczynski, and O. Mirabella,\Improving the real-time behavior of Ethernet networks using tra_c smoothing," IEEE Trans- actions on Industrial Informatics, vol. 1, no. 3,pp. 151{161, 2005.

[13] J. Sobrinho and A. Krishnakumar, \Quality-ofservicein ad hoc carrier sense multiple access wireless networks," IEEE J. Sel. Areas Commun, vol. 17, no. 8, pp. 1353 { 68, 1999.

[14] J. L. Sobrinho and A. Krishnakumar, \EQuB -Ethernet Quality of Service using black bursts," Conference on Local Computer Networks, pp.286 { 296, 1998.

[15] J.-P. Sheu, C.-H. Liu, S.-L. Wu, and Y.-C.Tseng, \A priority MAC protocol to support real-time tra_c in ad hoc networks," Wireless Networks, vol. 10, no. 1, pp. 61 { 69, 2004.

[16] R. Moraes, F. Vasques, P. Portugal, and J. A.Fonseca, \VTP-CSMA: A virtual token passing approach for real-time communication in IEEE 802.11 wireless networks," IEEE Transactions on Industrial Informatics, vol. 3, no. 3, pp. 215{ 224, August 2007.

[17] D. Miorandi and S. Vitturi, \Analysis of masterslave protocols for real-time industrial communications over IEEE 802.11 WLANs," 2nd IEEE International Conference on Industrial Infor-matics, pp. 143 { 148, 2004.

[18] M. Rashid, E. Hossain, and V. Bhargava, \Controlled channel access scheduling for guaranteed QoS in 802.11e-based wlans," IEEE Transac-tions on Wireless Communications, vol. 7, no. 4, pp. 1287{1297, April 2008.

[19] G. Bianchi, I. Tinnirello, and L. Scalia, \Understanding 802.11e contention-based prioritizationmechanisms and their coexistence with legacy802.11 stations," IEEE Network, vol. 19, no. 4,pp. 28 { 34, 2005.

[20] \O. Tech. OPNET," Available at:http://www.opnet.com,2010.

Srinivas Sadineni Currently pursuing M.tech in Computer Science and Engineering at SR Engineering College, Warangal, India. His research interest includes bandwidth estimation in networks, Mobile Adhoc networks.

M.Shashikala has 6+ years of experience in teaching field. Her areas of interest include Data Mining. She has published research papers in various National and International Journals, National and International Conferences. She also attended many National Seminars/FDP/Workshops Etc.

Effect of Heat Treatments on Antioxidant Activity in Sucrose-Milk Protein Model Systems

Preeti Shukla[1], Usha Bajwa[2]

[1,2] *Department of Food Science and Technology, Punjab Agricultural University, Ludhiana, 141004, India,*

ABSTRACT:

An investigation was carried out to estimate the antioxidant activity in simulated milk beverage model systems at different heat treatments equivalent to industrial processing of dairy beverages. Model systems of sucrose and milk proteins (whey protein and casein) were given different heat treatments to generate Maillard reaction products. These MRPs were considered to elevate the antioxidant activity in dairy beverages. Percentage inhibition of DPPH as a measure of antioxidant activity was determined at different time intervals. The study showed that there was a significant difference in the free radical scavenging activity of samples at different time intervals at a given temperature.

KEYWORDS: *Antioxidant, Free radical scavenging activity, HMF, Maillard reaction, Proteins, Sucrose,*

I. INTRODUCTION

Consumption of milk confers a number of nutritional benefit [1]. Besides the valuable macro and micro-nutrients, milk also contains antioxidant factors. These are due to by naturally occurring vitamins (i.e. E and C), beta carotene and enzymatic systems mainly superoxide dismutase, catalase and glutathione peroxidase [2]. Furthermore, it has been reported that milk antioxidant activity increases as a consequence of thermal treatments, due to protein unfolding and exposure of thiol groups, potentially acting as hydrogen donors [3,4]. Almost all dairy products are manufactured from heated milk because of specific reasons involving microbial stability and safety, shelf-life extension, or technological aspects related to product functionality or quality [5]. Depending on the intensity of the thermal treatment applied, pro-oxidant or antioxidant molecules are expected to be produced. The Maillard reaction has been used to produce foods that look and taste attractive for thousands of years, for as long as food has been cooked [6]. Both caramelization and the Maillard reaction are responsible for the development of attractive colours and flavours in heat-processed foods.The modern food industry relies on the application of Maillard reaction products to produce many foods like coffee, bakery and dairy products that possess the color and flavor demanded by the consumers. Some indigenous milk products like *khoa,* flavored milk, *burfi, kalakand* also undergo such reactions during prolonged heating and impart characteristic color and flavor which is liked by the people of Indian continent [7].The Maillard reaction is a complex network of reactions that occur during processing and storage of several foodstuffs. Several methods have been used for determining the extent to which it has progressed, such as the 2-thiobarbituric acid (TBA) method, periodate oxidation, borohydride reduction, and furosine and carboxy methyllysine determination [8]. Many studies have appeared on the application of HMF as an index of heat treatments in milk products and other foodstuffs. 5-(Hydroxymethyl)-2- furfuraldehyde (HMF) is formed upon heat treatment of milk and milk resembling systems by the Maillard reaction, via its Amadori product, and also by isomerization and subsequent degradation of sugars. Traditionally, the HMF content has been used as an indicator of both degradation routes.

Maillard reaction products generated from sugar-protein model in food materials during processing and storage have strong antioxidant activity [9]. The antioxidant activity of MRPs was first reported [10] and has been extensively investigated thereafter [11]. The higher interaction between lactose and proteins in milk having higher pH value could lead to more Maillard Reaction Products (MRP) as well as more polymerisation of protein [12]. When foods are heat processed, the sugars and lipids react with the proteins they contain via the Maillard and related reactions to form a wide range of products. As a result, the sensory, safety, nutritional and health-promoting attributes of the foods are enhanced [13]. Some fractions were reported to have strong antioxidant properties comparable to those of commonly used food antioxidants [14]. The action mechanisms are supposed to involve radical chain-breaking activity [15], metal-chelating ability [16], active oxygen species scavenging and hydrogen peroxide destroying ability [17, 18]. The Maillard reaction occurs in three stages (early, intermediate and final stage), and is dependent upon factors such as reactants type and concentration, temperature, time, pH and water activity [19].

Upon heating foods at high temperature, 5-hydroxy- methyl-2-furfuraldehyde (HMF) is naturally generated by two possible pathways: (1) caramelization, where the reducing carbohydrates, including maltose and maltotriose [20], directly undergo 1-2 enolization, dehydration and cyclization reactions; and (2) the Maillard reaction, where the Amadori product, formed by reaction with the amino group of free amino acids or proteins, undergoes enolization and subsequent dehydration of the sugar moiety while releasing the amino acid intact [21]. Current knowledge is not sufficient to identify the technological conditions which either promote or inhibit the formation of antioxidative components in milk products. For these reasons, it would be valuable to determine the processing conditions that improve antioxidant potential and minimise oxidative reactions responsible for a decline of milk quality attributes. Research considering the antioxidant activity of MRPs has been performed mostly with sugar-amino acid models, relatively less is known about the antioxidant activity potential of sucrose-milk protein models representing the effect of heat treatment on sweetened dairy beverages. Since most dairy beverages contain native milk proteins (whey proteins and casein) and sucrose (as sweetening agent), the purpose of this study was to determine the effect of heat treatments below and above 100 °C on the antioxidant activity of milk beverages. This knowledge could provide information not only on the overall health protecting potential of milk products but also on the stability of complex foods containing milk.

II. MATERIALS AND METHODS:

Milk was procured from College of Dairy Science and Technology, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU)**. S**ucrose was purchased from local market of Ludhiana, Punjab. Whey protein concentrate (70 %) was supplied by Mahaan proteins, New Delhi, soluble casein (99.9 %) was made available by SD fine chemicals. DPPH was obtained from Sigma Aldrich, USA. All the chemicals used were AR grade.

2.1. Milk samples

Thirteen samples were prepared using different combinations of Whey protein concentrate (0.5 to 1.0%), Casein (0.5 to 1.0%), and sucrose (6%) in 100 mM Phosphate Buffer (pH 7.0). Skimmed milk (0.5 % milk fat) with and without sugar were taken as control samples. All the samples were subjected to different heat treatments equivalent to pasteurization and sterilization of a dairy beverage to generate Maillard Reaction Products.

Variables	**Temperature**	**Time**
	63 °C	30, 40, 50 min
	73 °C	15, 30, 45 sec
	83 °C	15, 20, 25 sec
	110 °C	25, 30, 35 min
	116 °C	20, 25, 30 min
	121 °C	15, 20, 25 min

Model solutions were heated in stoppered test tubes in a water bath at temperature from 63 to 73°C. For temperature above 100°C, the samples were autoclaved at different pressures to attain required temperature (5 psi for 110°C, 10 psi for 116°C and 15 psi for 121°C). After pre-determined heat treatments, the samples were immersed in ice bath for rapid cooling. Thereafter, samples were stored at 4°C and analyzed within 3 h. All analyses were performed in triplicate.

Chemical analysis

Antioxidant Activity estimation

Antioxidant activity was estimated using standard procedure of DPPH (2, 2-diphenyl1-picrylhydrazyl) assay [22]. Six ml of DPPH solution (0.2mM in 80% methanol) was mixed with 2 ml of each sample. The samples were incubated for 30 min. in dark. The absorbance (A) was measured at 518 nm in Spectronic-20 (Bausch and Lomb, USA) spectrophotometer. The percentage of the radical scavenging activity was calculated as percentage inhibition of DPPH radicals using the following equation:

% inhibition of DPPH = [A control – A sample] / A control × 100

Two ml Methanol (80%) plus 6 ml distilled water was used as a blank. In control, DPPH solution replaced distilled water.

Statistical analysis

Factorial CRD with multiple replications was carried out and difference between means was obtained using CPCS-1 software developed by the Department of Mathematics and Statistics, PAU, Ludhiana, India. All the statistical procedures were performed at a significance level of 95%.

III. RESULTS AND DISCUSSION

Effect of heat treatment (below 100 °C) on Antioxidant activity

There was a significant increase in the antioxidant activities in samples as the heating time increased at a given temperature (Table 1). The antioxidant activity of the control sample was found lowest while sample nine showed antioxidant activity during heating. This may be due to the higher amounts of casein as well as whey protein present in sample nine which react with sucrose to generate augmented amounts of MRPs. Whey proteins and casein have more amount of lysine amino acid. This lysine is highly reactive with sucrose to generate MRPs readily [23].Heat treatment below 100°C showed that most of the samples were significantly different for antioxidant activity values at the initial stage. It indicates that the amount and nature of substrate has a marked effect on the generation of MRPs, which may affect the antioxidant activity. Similarly, at the later stages of heating (above 100°C) there was a significant difference observed between all the samples in terms of antioxidant activities. It was noted that natural milk system (skimmed milk) had antioxidant activity of 24.13 which increased to 32.49 in presence of 6 percent sucrose. This indicates that presence of sucrose in milk beverage has a marked effect on MRP generation. This may be due to the fact that antioxidants activity in biological systems is dependent on a multitude of factors, including the colloidal properties of the substrates, the conditions and stages of oxidation, temperature, pH, time of heating and the localization of antioxidants in different phases. Intervals can be accounted for the MRPs whose antiradical properties are well documented [24]. The findings are in agreement with the previous data from Taylor and Richardson (1980) which states that heat treatment of milk is associated with the increase in antioxidant activity.

Earlier found that the free radical scavenging activities of different model systems containing glucose or lactose sugar with lysine, alanine or glycine amino acids increased drastically during heating [25]. Such an increase was detected over different time frames depending on the heating temperature. However, the metal ion binding of MRPs could represent a mechanism for antioxidant activity more than direct free radical scavenging activity [26]. Calligaris et al. (2004) stated that food products heated at 90 °C or above even for seconds may show a significant change in antioxidant activity related to MRP generation in the system. The increase in free radical scavenging activity of MRPs increased from 0 to 70% as the heating time increased from 0 to 10 h at constant temperature [28].

Effect of heat treatment (above 100 °C) on Antioxidant activity

Heat treatments above 110°C led to the generation of brown colored samples. This color development was mainly due to the formation of chromophores, which have been widely studied in different model systems [29, 30, 31]. The development of Maillard reaction was clearly indicated by milk browning, which promptly occurred when heat treatment was performed at 120°C and slowly developed after 1.5- and 2-h heating at 80°C and 90°C, respectively. Higher the temperature yielded more MRPs that is why the antioxidant activities at elevated temperatures had higher values. Maillard reactions occur slowly at 35 °C, but are accelerated at a temperature 55°C or greater [32]. The brown color generated from sucrose-protein model systems are mainly due to the formation of protein oligomers that are mediated by chromophoric sub structures derived from carbohydrates [33]. Moreover recently attempted to correlate the biological and chemical effects of MRPs with the browning rates [34].

IV. CONCLUSION

The functionality of several heat-induced parameters in relation to antioxidant activity as a result of Maillard Reaction Products (MRPs) generation has been studied on different sucrose-protein model systems. The extent of generation of MRPs during the heat treatment may be evaluated using antioxidant activity as an index. Antioxidant activity increased significantly with increase in heating time at a given temperature. The simultaneous application of several heat-induced parameters may improve the classification of industrial processes of milk and dairy products, yielding a useful tool for optimization of processing conditions for better functionality and stability of the prepared dairy products.

REFERENCES

[1] Walzem R L, Dillard C J, German J B (2002). Whey components: millennia of evolution create functionalities for mammalian nutrition: What we know and what we may be overlooking. Critical Reviews in Food Science and Nutrition, 42(4), 353–375.

[2] Landmark-Mansson H, Akesson B (2000). Antioxidative factors in milk. British Journal of Nutrition, 84(Suppl. 1), S103–S110.

[3] Taylor M J and Richardson T (1980). Antioxidant Activity of Skim Milk: Effect of Heat and Resultant Sulfhydryl Groups. Journal of Dairy Science Volume 63, Issue 11, November 1980, Pages 1783–1795.

[4] Tong L M, Sasaki S, Mc Clements D J, Decker E A (2000). Mechanism of antioxidant activity of a high molecular weight fraction of whey. Journal of Agricultural and Food Science, 48, 1473–1478.

[5] Jelen P and Rattray W (1995). Thermal denaturation of whey proteins. Chapter 4. Pp. 66–80. In: Heat-induced changes in Milk (edited by. Brussels, Belgium: International Dairy Federation.

[6] Nicoli M C, Anese M, Parpinel M (1999). Influence of processing on the antioxidant properties of fruit and vegetables. Trends in Food Science and Technology, 10, 94–100

[7] Baltes W (1982). Chemical changes in foods by the Maillard reaction. Food chemistry 9(1): 59-73.
[8] Furth A J, Methods of assaying non enzymatic glycosylation. Anal. Biochem. 1988, 175, 347-360.
[9] Rao M S, Chawla S P, Chander R and Sharma A (2011) Antioxidant potential of Maillard reaction products formed by irradiation of Chitosan glucose solution. Carbohydrate Polymers 83: 714-19.
[10] Franzke C, Iwainsky H (1954). Antioxidant capacity of melanoidin. Deut Lebensm-Rundsch, 50, 251-254.
[11] Benjakul S, Lertittikul W, Bauer F (2005). Antioxidant activity of Maillard reaction products from a porcine plasma protein-sugar model system. Food Chem, 93: 189-196.
[12] Gothwal P P and Bhavadasan M K, (1992) Studies on the browning characteristics in dairy products. Indian J Dairy Sci. 45: 146-51.
[13] Ames J M (2009) Dietary Maillard reaction products: implications for human health and disease. Czech J Food Sci 27: S66-S69.
[14] Lingnert H, Hall G (1986). Formation of antioxidative Maillard reaction products during food processing. In M.Fujimaki, M.Namiki, & E.Kato, Amino-carbonyl reactions in food and biological systems. Tokyo: Elsevier, pp. 273-279.
[15] Morales F J and Babbel M B (2002). Antiradical efficiency of Maillard reaction mixtures in a hydrophilic media. J Agric Food Chem 50: 2788-92.
[16] Bersuder P, Hole M, Smith G (2001). Antioxidants from a heated histidine-glucose model system. Investigation of the copper (II) binding ability. J Amer Oil Chem Soc 78: 1079-82.
[17] Wijewickreme A N, Krejpcio Z and Kitts D D (1999). Hydroxyl scavenging activity of glucose, fructose, and ribose-lysine model Maillard products. J Agric Food Chem 64: 457-61.
[18] Giroux H J, Acteau G, Sabik H and Britten M (2008) Influence of dissolved gases and heat treatments on the oxidative degradation of polyunsaturated fatty acids enriched dairy beverages. J Agric Food Chem 56: 5710-16.
[19] Hwang I G, Young Kim, Woob K S, Lee J and Jeong H S (2011) Biological activities of maillard reaction products (MRPs) in a sugar amino acid model system. Food Chem 126: 221–27.
[20] Kroh L W (1994). Caramelization in food and beverages. Food Chemistry, 51(4), 373–379.
[21] Friedman M (1996). Food browning and its prevention: an overview. Journal Agricultural And Food Chemistry, Vol.44, No.3, January, pp. 631-653, ISSN 0021-8561.
[22] Hall W L, D J Millward, S J Long and L M Morgan (2002). Casein and whey exert different effects on plasma amino acid profiles, gastrointestinal hormone secretion and appetite. British Journal of Nutrition, 89, 239–248.
[23] Nicoli M C, Anese M, Manzocco L, Lerici C R (1997). Antioxidant properties of coffee brews in relation to the roasting degrees. Lebensmittel-Wissenschaft und-Technologie, 30, 292–297.
[24] Morales F J, Jimenez-Perez S (2001). Free radical scavenging capacity of Maillard reaction products as related to colour and fluorescence. Food Chemistry, 72, 119–125.
[25] Wijewickreme A N and Kitts D D (1997) Hydroxyl scavenging activity of glucose, fructose, and ribose-lysine model Maillard products. J Agric Food Chem 64: 457-61.
[26] Calligaris S, Lara Manzocco, Monica Anese, Maria Cristina Nicoli (2004). Effect of heat-treatment on the antioxidant and pro-oxidant activity of milk. International Dairy Journal. 14 (2004) 421–427.
[27] Zhuang Y and Sun L (2011) Antioxidant activity of Maillard reaction products from lysine-glucose model system as related to optical property and copper (II) binding ability. African J Biotechnol. 10: 6784-93.
[28] Rizzi G P (1997). Chemical Structure of Coloured Maillard Reactions Products. Food Reviews International. 13, 1–28.
[29] Tressel R, Wondrak G T, Kruger R P, Rewicki D (1998). New melanoidin-like Maillard polymers from 2-deoxypentoses. Journal of Ag and Food Chem. 461, 104-110.
[30] Monti S M, Borelli R C, Ritieni A, Fogliano V (2000). A comparison of color formation and Maillard reaction products of a lactose-lysine and lactose-N-acetyllysine model system. Journal of Ag and Food Chem. 48, 1041-1046.
[31] Cerrutti P, Resnik S L, Seldes A, Fontan C F (1985). Kinetics of deterioration in model food systems of high water activity: glucose loss, 5-hydroxymethylfurfural accumulation and fluorescence development due to non-enzymatic browning. Journal of Food Science. 50, 627-630.
[32] Hofmann T, Bors W, Stettmaier K (1999). Radical-assisted melanoidin formation during thermal processing of foods as well as under physiological conditions. Journal of Agricultural and Food Science, 47, 391–396.
[33] Brands M J, Alink G M, Van Boekel M A J S and Jongen WMF (2000). Mutagenicity of Heated Sugar-casein Systems: Effect of the Maillard Reaction. J. Agric. Food Sci. 48, 2271– 2275.

Table 1 Effect of heat treatment (below 100 °C) on Antioxidant activity

Sr.No	Treatments (%)			63 °C				73 °C				83 °C			
	Whey Protein	Casein	Sugar	30 min	40 min	50 min	Mean	15 sec	30 sec	45 sec	Mean	15 sec	20 sec	25 sec	Mean
1	0	0	0	$0.01^{h,1}$	$0.01^{i,2}$	$0.01^{i,3}$	0.01	$0.01^{i,1}$	$0.01^{i,2}$	$0.01^{i,3}$	0.01	$0.01^{m,1}$	$0.01^{i,2}$	$0.01^{k,3}$	0.01
2	0	0.5	6	$19.37^{e,1}$	$32.72^{e,f,2}$	$42.30^{e,3}$	31.46	$28.38^{f,1}$	$42.38^{b,2}$	$59.32^{f,3}$	43.36	$32.57^{j,1}$	$36.28^{j,2}$	$39.38^{i,3}$	36.08
3	0	1	6	$24.67^{c,d,1}$	$36.42^{d,2}$	$45.59^{d,3}$	35.56	$34.66^{c,1}$	$54.65^{f,2}$	$61.34^{e,3}$	50.22	$36.26^{h,1}$	$42.33^{g,2}$	$48.46^{f,3}$	42.35
4	0.5	0	6	$11.45^{g,1}$	$28.30^{g,2}$	$39.37^{f,3}$	26.37	$33.49^{f,1}$	$54.55^{f,2}$	$57.24^{g,3}$	48.42	$33.20^{i,1}$	$38.25^{i,2}$	$43.52^{h,3}$	38.32
5	0.5	0.5	6	$23.50^{d,1}$	$44.61^{c,2}$	$48.29^{c,3}$	38.80	$40.30^{g,1}$	$64.73^{e,2}$	$67.36^{d,3}$	57.46	$42.28^{g,1}$	$49.43^{e,2}$	$51.42^{e,3}$	47.71
6	0.5	1	6	$26.57^{b,c,1}$	$58.42^{a,2}$	$53.28^{b,3}$	46.09	$46.39^{e,1}$	$66.75^{d,2}$	$69.48^{c,3}$	60.88	$48.15^{c,1}$	$54.47^{d,2}$	$62.25^{c,3}$	54.96
7	1	0	6	$16.46^{f,1}$	$30.36^{f,g,2}$	$46.28^{c,d,3}$	31.03	$52.60^{d,1}$	$68.44^{c,2}$	$69.48^{c,3}$	63.51	$45.18^{e,1}$	$49.31^{e,2}$	$59.31^{d,3}$	51.27
8	1	0.5	6	$27.28^{a,b,1}$	$48.25^{b,2}$	$52.39^{b,3}$	42.64	$57.34^{c,1}$	$72.43^{b,2}$	$74.36^{b,3}$	68.05	$46.14^{d,1}$	$57.57^{b,2}$	$63.39^{b,3}$	55.70
9	1	1	6	$29.51^{a,1}$	$59.31^{a,2}$	$59.30^{a,3}$	49.37	$58.62^{b,1}$	$75.47^{a,2}$	$79.35^{a,3}$	71.15	$52.58^{a,1}$	$65.49^{a,2}$	$75.50^{a,3}$	64.52
10	0.738	3.012	6	$11.85^{g,1}$	$20.48^{i,2}$	$36.58^{e,3}$	22.97	$22.42^{g,1}$	$13.46^{k,2}$	$16.39^{k,3}$	17.42	$13.46^{l,1}$	$18.43^{k,2}$	$25.44^{j,3}$	19.11
11	Skimmed milk		-	$17.23^{e,f,1}$	$25.63^{h,2}$	$29.54^{h,3}$	24.13	$26.64^{k,1}$	$32.62^{j,2}$	$41.47^{j,3}$	33.58	$31.52^{k,1}$	$40.62^{h,2}$	$46.34^{g,3}$	39.49
12	Skimmed milk		6	$24.64^{c,d,1}$	$33.40^{e,2}$	$39.44^{f,3}$	32.49	$32.67^{j,1}$	$38.53^{i,2}$	$44.25^{i,3}$	38.48	$40.39^{g,1}$	$45.78^{f,2}$	$51.57^{e,3}$	45.91
13	0.738	3.012	-	$27.58^{a,b,1}$	$37.40^{d,2}$	$42.59^{e,3}$	35.86	$38.13^{h,1}$	$45.46^{g,2}$	$49.31^{h,3}$	44.22	$51.22^{b,1}$	$55.58^{c,2}$	$59.46^{d,3}$	55.42
Mean				20.02	35.02	41.15		36.28	48.42	53.03		36.38	42.58	48.16	

*significant at p≤0

Means with different superscripts (a, b…m) differ significantly (p≤0.05) in a column
Means with different superscripts (1, 2, 3) differ significantly (p≤0.05) in a row

Source	Df	MSS		
		110 °C	116 °C	121 °C
A(Time)	2	1972.2860*	1517.1750*	1655.2970*
B (Samples)	12	3028.5660*	2951.7350*	2876.9730*
AXB	24	34.217610*	45.296220*	63.484540*
ERROR	78	.25120190	.27909650	28.730120

*significant at p≤0.05

Table 2 Effect of heat treatment (above 100 °C) on Antioxidant activity

Sr.No	Treatments (%)			110 °C				116 °C				121 °C			
	Whey Protein	Casein	Sugar	25 min	30 min	35 min	Mean	20 min	25 min	30 min	Mean	15 min	20 min	25 min	Mean
1	0	0	0	$0.01^{k,1}$	$0.01^{m,2}$	$0.01^{m,3}$	0.01	$0.01^{l,1}$	$0.01^{m,2}$	$0.01^{l,3}$	0.01	$0.01^{e,1}$	$0.01^{e,2}$	$0.01^{f,3}$	0.01
2	0	0.5	6	$14.47^{i,1}$	$18.2^{i,2}$	$129.04^{b,3}$	20.67	$24.44^{b,1}$	$31.45^{b,2}$	$37.91^{i,3}$	31.27	$27.35^{f,1}$	$33.15^{f,2}$	$41.45^{e,3}$	33.98
3	0	1	6	$24.44^{b,1}$	$30.20^{f,2}$	$43.09^{b,3}$	32.57	$27.66^{g,1}$	$35.53^{g,2}$	$45.71^{g,3}$	63.30	$33.16^{g,1}$	$37.46^{g,2}$	$46.46^{g,3}$	39.03
4	0.5	0	6	$37.20^{e,1}$	$50.28^{e,2}$	$57.41^{e,3}$	48.30	$51.62^{e,1}$	$59.43^{e,2}$	$62.23^{e,3}$	57.76	$54.47^{eb,1}$	$61.75^{b,2}$	$68.13^{b,3}$	61.45
5	0.5	0.5	6	$25.49^{g,1}$	$32.57^{h,2}$	$47.70^{f,3}$	35.25	$29.39^{h,1}$	$36.43^{f,2}$	$53.47^{f,3}$	39.76	$39.28^{d,1}$	$41.75^{d,e,2}$	$55.34^{e,3}$	45.46
6	0.5	1	6	$55.47^{b,1}$	$61.50^{b,2}$	$65.80^{b,3}$	60.92	$57.45^{b,1}$	$64.48^{b,2}$	$68.11^{b,3}$	63.35	$58.24^{a,1}$	$66.46^{a,2}$	$69.44^{b,3}$	64.71
7	1	0	6	$41.45^{d,1}$	$45.42^{g,2}$	$53.70^{e,3}$	46.86	$49.35^{e,1}$	$51.52^{e,2}$	$53.35^{f,3}$	51.41	$51.15^{b,1}$	$61.70^{b,2}$	$65.41^{b,3}$	59.42
8	1	0.5	6	$53.86^{a,1}$	$63.28^{b,2}$	$64.44^{a,3}$	60.53	$55.61^{a,1}$	$66.45^{a,2}$	$67.33^{a,3}$	63.12	$55.69^{ab,1}$	$68.89^{a,2}$	$69.57^{b,3}$	64.72
9	1	1	6	$56.48^{a,1}$	$65.22^{a,2}$	$68.87^{a,3}$	63.53	$61.35^{a,1}$	$65.50^{b,2}$	$75.55^{a,3}$	67.47	$44.56^{d,1}$	$68.46^{a,2}$	$79.11^{a,3}$	64.04
10	0.738	3.012	6	$14.32^{i,1}$	$22.73^{h,2}$	$26.53^{i,3}$	21.19	$27.32^{g,1}$	$28.48^{g,2}$	$34.42^{h,3}$	30.07	$33.21^{g,1}$	$34.51^{f,2}$	$43.17^{e,e,3}$	36.96
11	Skimmed milk		-	$19.50^{j,1}$	$28.35^{g,2}$	$38.55^{g,3}$	28.80	$26.83^{g,1}$	$39.17^{e,2}$	$49.26^{e,3}$	38.42	$41.64^{e,e,1}$	$44.41^{e,e,2}$	$55.24^{e,3}$	47.09
12	Skimmed milk		6	$26.91^{g,1}$	$36.49^{f,2}$	$39.43^{g,3}$	34.28	$39.58^{d,1}$	$48.35^{f,2}$	$47.35^{h,3}$	45.15	$45.55^{e,1}$	$47.35^{e,2}$	$47.59^{e,3}$	46.83
13	0.738	3.012	-	$25.39^{g,1}$	$35.44^{g,2}$	$45.31^{g,3}$	35.38	$36.55^{f,1}$	$42.78^{g,2}$	$54.45^{e,3}$	44.60	$44.83^{e,1}$	$48.63^{e,2}$	$57.59^{e,3}$	50.35

Means with different superscripts (a, b…m) differ significantly (p≤0.05) in a column
Means with different superscripts (1,2,3) differ significantly (p≤0.05) in a row

Source	Df	MSS		
		110 °C	116 °C	121 °C
A(Time)	2	1972.2860*	1517.1750*	1655.2970*
B (Samples)	12	3028.5660*	2951.7350*	2876.9730*
AXB	24	34.217610*	45.296220*	63.484540*
ERROR	78	.25120190	.27909650	28.730120

*significant at p≤0.05

An Experimental Investigation on Condensation Heat Transfer of Microchannel Heat Exchangers

Thanhtrung Dang and Minhhung Doan

Department of Heat and Refrigeration Technology, Ho Chi Minh City University of Technical Education, Ho Chi Minh City, Vietnam

ABSTRACT:

The present study investigated experimentally condensation heat transfer of two microchannel heat exchangers. The heat transfer rate of a microchannel heat exchanger was achieved 272.9 W for the vapor having the inlet temperature of 101 ºC and the mass flow rate of 0.123 g/s and for the cooling water having the inlet temperature of 32ºC and mass flow rate of 3.1133 g/s. It was also observed that the heat transfer rate obtained from the counter flow arrangement is always higher than that obtained from the parallel one: the value obtained from the counter flow arrangement is 1.04 to 1.05 times of that obtained from the parallel flow. The results for two phases are in good agreement with the results for single phase. In addition, the condensation heat transfer coefficient in the microchannel heat exchangers decreases as increasing the inlet cooling water temperature.

KEYWORDS: *Microchannel, condensation, configuration, heat exchanger, efficiency.*

NOMENCLATURE

h	entalpy	kJ/kg
m	mass flow rate	kg/s
Q	heat transfer rate	W
T	temperature	ºC

Subscripts

i	*inlet*
o	*outlet*
v	vapor
w	water

Greek symbols

η	efficiency

I. INTRODUCTION

The use of microchannel heat exchangers can bring advantages such as enhanced heat transfer coefficient and decreased characteristic dimension. The use is found in chemical, medical areas and in micro electro-mechanical systems (MEMs). In relevant studies of microchannel heat transfer, Hu and Chao [1] studied five condensation flow patterns for water in silicon micro condenser. For a hydraulic diameter of 73 μm and the range of mass fluxes of steam from 5 to 45 kg/(m^2s), the heat transfer coefficients obtained were from 220 to 2400 W/(m^2K) and the corresponding pressure drops were from 100 to 750 kPa/m. In the study, the maximum heat flux achieved was 40 kW/m^2. The study indicated that cooling capacity and the coefficient of performance (COP) of the microchannel condenser were higher than those of the conventional condenser under the same operating condition. In addition, the amount of fluids used in the heat exchanger systems with microchannel condensers was smaller than that with the conventional one. Two R410A residential air-conditioning systems, one with a microchannel condenser and the other with a round-tube condenser, were studied by Park and Hrnjak [2]. The cooling capacity and the coefficient of performance (COP) of the system with the microchannel condenser were 3.4% and 13.1% higher, respectively, than those obtained with the round condenser. The amount of working fluids charged for the system with the microchannel condenser was 9.2% smaller than that with the round-tube condenser. The numerical model also used to calculate for the non-uniform distribution of the air and refrigerant. The numerical results did not make a significant difference for predicting the condenser capacity. Numerical model for microchannel condensers and gas coolers was investigated by Martínez-Ballester et al. [3].

The main conclusion of this study is that it is possible to take into account the heat conduction between tubes in a more fundamental way than other fin efficiency based approaches, which have to apply heat conduction terms to an approach that uses the adiabatic-fin-tip assumption, which is not satisfied in such cases. However, this study just indicated in description and validation state only. Cho et al. [4] studied the fabrication of the micro condenser tube by direct extrusion. The materials used to manufacture for this micro condenser are A1100 and A3003 aluminum alloy. Because A3003 alloy can be durable when it used in a heat exchanger that requires high working pressure, so A3003 alloy is more suitable than A1100 alloy for the condenser tube with eco-friendly refrigerant usage. A comparison of condensation heat transfer and pressure drop of CO_2 in rectangular microchannels was studied by Heo et al. [5]. The condensation heat transfer coefficients of CO_2 in rectangular microchannels with 7, 23, and 19 ports were experimentally investigated with the variation of the mass flux. The condensation heat transfer coefficient increased with the decrease in hydraulic diameter, which is dominant at condensation temperatures of 0 and -5 °C. Increasing or decreasing the heat transfer coefficient at critical vapor quality was observed for the microchannel of 23 ports. The existing models for the prediction of heat transfer coefficients over-predicted the experimental data and the model of relevant literature showed the smallest deviation of 47.7%. A study on condensation of compact heat exchanger was done by García-Cascales et al. [6]. In this study, an iterative algorithm has been suggested for the study of two-row heat exchangers. A brief state-of-the-art study has been done for condensation in micro- and mini-channels and some remarkable correlations introduced in the existing literature have been described. They have also been compared under typical operating conditions. Several heat exchangers working as a condenser or an evaporator have been studied experimentally and the results obtained have been compared with those provided by the model. Hrnjak and Litch [7] presented a study of two aluminum condensers: a microchannel condenser (a parallel tube arrangement between headers and microchannel tubes, having a hydraulic diameter D_h = 0.7 mm) and another one (with single serpentine macrochannel tube having a hydraulic diameter D_h = 4.06 mm). The ratio between amount of working fluids charged and capacity of the microchannel condenser was around 76% less than for the serpentine condenser.

Dang and Teng [8, 9] studied the effects of configurations on performance of the microchannel and minichannel heat exchangers. Effect of flow arrangement on the heat transfer related behaviors of a microchannel heat exchanger was presented by Dang and Teng [10]. For all cases done in the study, the heat flux and performance index obtained from the counter-flow arrangement are always higher than those obtained from the parallel-flow one: the values obtained from the counter-flow are 1.1 to 1.2 times of those obtained from the parallel-flow. However, in [8-10] they studied on microchannel heat transfer on single phase. Goss and Bassoc [11] studied heat transfer during the condensation of R134a inside eight parallel microchannels. The study indicated that there is no clear influence of the fluid saturation temperature and the heat flux removed on the heat transfer coefficient for the range tested. On the other hand, the heat transfer coefficient value increases with rising the mass velocity. It is also demonstrated that the consideration that all of the heat transfer resistance is due to the heat conduction through the liquid film is a good approximation. The interfacial and disjoining pressure resistances can be neglected even in the higher quality range. From the above literatures, it is important to study the efficiency of condensation heat transfer in microchannel heat exchangers. For the present study, two microchannel heat exchangers with different geometrical configurations will be discussed.

II. METHODOLOGY

The experimental system consists of four major components: the test sections (the microchannel heat exchangers), pump system, steam boiler, and overall testing loop, as shown in Fig. 1. The vapor produced in the boiler passes through the micro condenser, where it condenses by the cooling water. Two microchannel heat exchangers were designed and tested in this study. Figure 2 shows the dimensions of the test sections. The material for the heat exchangers is aluminum, used as a substrate with thermal conductivity of 237 W/(mK), density of 2,700 kg/m^3, and specific heat at constant pressure of 904 J/(kg K). At each inlet or outlet, a temperature sensor was set to record temperature values. The inlet and outlet water temperatures were measured using T-type thermocouples. These thermocouples were inserted into the tubes at the inlets and the outlets. So, there were total four temperature sensors were used to record data.

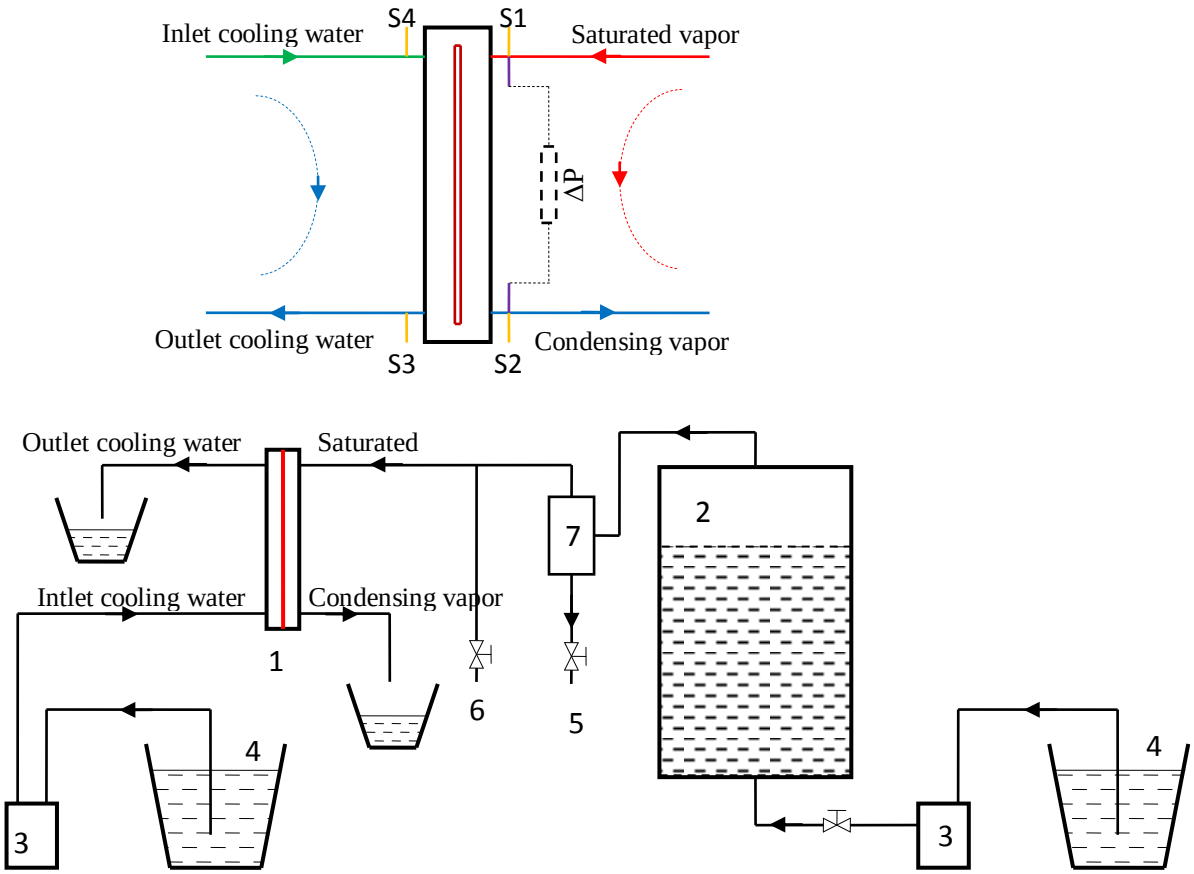


Fig. 1. Schematic of the test loop

1. Microchannel heat exchanger;
2. Electric mini Boiler;
3. Mini pump;
4. Water tank;
5. Condensing vapor valve;
6. Adjusting valve;
7. Buffer tank

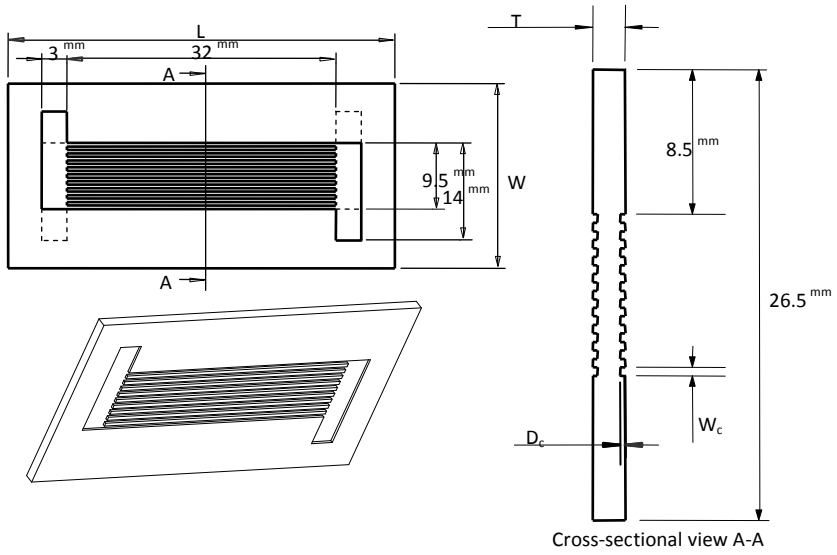


Fig. 2. Dimensions of the test section

Basically, the two microchannel heat exchangers (T1 and T2) have the same dimensions; however, the substrate thickness of T1 is 1.2 mm while T2 is 1 mm and the channel depth for the cooling water side of T1 channel is 300 μm (having hydraulic diameter of 375 μm) while T2 is 180 μm (having hydraulic diameter of 265 μm). Geometric parameters of the microchannel heat exchangers are listed in Table 1.

Table 1. Geometric parameters of the microchannel heat exchangers

No.	Dimensions of the substrate (mm)			Dimensions of the channel (μm)			
				Vapor side		Cooling water side	
	L	W	T	W_c	D_c	W_c	D_c
T1	46	26.5	1.2	500	300	500	300
T2	46	26.5	1	500	300	500	180

All channels are connected with a manifold for each inlet or outlet of vapor and cooling water, respectively. The manifolds have a rectangular shape with the width of 3 mm and the depth of 300 μm. Figure 3 shows a photo of the microchannel heat exchanger T1. These test sections of the heat exchangers were manufactured by precision micromachining [8-10]. Each inlet or outlet of the heat exchangers has cross-sectional area of 9 mm^2. The four sides of the heat exchanger were thermally insulated by the glass wool with a thickness of 5 mm. To seal the microchannels, two layers of PMMA (polymethyl methacrylate) are bonded on the top and bottom sides of the substrate, as indicated in Fig. 3. The physical properties of the PMMA and the glass wool are listed in Table 2. Accuracies and ranges of testing apparatus are listed in Table 3.

Fig. 3. A photo of the test samples

Table 2. Physical properties of PMMA and glass wool

Material	Density kg/m^3	Thermal conductivity W/(mK)
PMMA	1420	0.19
Glass wool	154	0.051

Equipments used for the experiments are listed as follows:
[1] Thermocouples, Model PT-100, made by Omega
[2] Mini boiler, Model EMB-S-9, made by ELectromn
[3] Pump, VSP-1200, made by Tokyo Rikakikai
[4] Differential pressure transducer, Model UNIK5000, made by GE Druck
[5] Micro electronic balance, Model TP - 214, made by Denver.

Table 3. Accuracies and ranges of testing apparatuses

Testing apparatus	Accuracy	Range
Thermocouples	± 0.1 °C	0 ~100 °C
Differential pressure transducer	±0.04% FS	0 ~1 bar
Precision balance	± 0.0015 g	0.0000 ~ 210g

III. RESULTS AND DISCUSSION

For the experiments carried out in this study, the condensation heat transfer of the heat exchangers is discussed as follows.

The energy balance equation is calculated by

$$Q_v \eta = Q_w \quad (1)$$

Or $$m_v(h_{vi} - h_{vo})\ \eta = m_w(h_{wo} - h_{wi}) \quad (2)$$

The heat transfer rate of the heat exchanger, Q, is calculated by

$$Q = Q_w = m_w(h_{wo} - h_{wi}) \quad (3)$$

where m is mass flow rate (subscripts v and w stand for the vapor side and water side, respectively), h_{vi}, h_{vo}, h_{wi} and h_{wo} are inlet and outlet enthalpy values of the vapor and cooling water sides, respectively [12].

Experimental data obtained from the microchannel heat exchangers are under the room temperature condition of 30~32°C. In order to compare the behaviors of heat transfer between the microchannel heat exchangers, all experimental conditions for the two heat exchangers were kept the same. The experimental results for T1 and T2 were recorded by MX 100 recorder; the calculated values were taken by the mean values. For all cases done in this study, the steam outlet from the mini boiler was the dry saturated vapor having the absolute pressure of 1.4 bar corresponding with the saturated temperature of 110 ºC. Because of the heat loss from the outlet of mini boiler to the inlet of microchannel heat exchanger, the inlet temperature of microchannel heat exchangers for vapor side was kept constantly at 101 ºC.

Table 3. Experimental results were recorded by MX100 recorder

a) for microchannel heat exchanger T1

Channel	Start Data No.	End Data No.	Min.	Max.	P-P	Mean	RMS
CH00001[C]	0	661	100.7	101.3	0.6	101.0	101.0
CH00002[C]	0	661	71.3	73.0	1.7	72.2	72.2
CH00003[C]	0	661	52.3	54.1	0.8	52.7	52.7
CH00004[C]	0	661	31.7	32.7	1.0	32.1	32.1

b) for microchannel heat exchanger T2

Channel	Start Data No.	End Data No.	Min.	Max.	P-P	Mean	RMS
CH00001[C]	0	406	98.7	102.7	4.0	101.0	101.0
CH00002[C]	0	406	38.7	40.0	1.3	39.3	39.3
CH00003[C]	0	406	39.7	40.9	1.2	40.2	40.2
CH00004[C]	0	406	31.6	32.1	0.5	31.9	31.9

In Table 3, the channel CH00001 is the saturated vapor temperature, the channel CH00002 is the condensing vapor temperature, the channel CH00003 is the outlet cooling water temperature, and the channel CH00004 is the inlet cooling water temperature. The results in Table 3 recorded for the cooling water having the inlet temperature of 32ºC and mass flow rate of 3.1133 g/s and for the vapor having the inlet temperature of 101 ºC. The results shown that the outlet temperatures for both vapor and water obtained from T1 are higher than those obtained from T2. As a result, the heat transfer rate obtained from the heat exchanger T1 (272.9 W) is higher than that obtained from the heat exchanger T2 (104.6 W). The heat transfer rate of two heat exchangers was calculated and shown in Table 4. The Table 4 shows that the mass flow rate of condensing vapor decreases as reducing the hydraulic diameter of channels.

Table 4. Heat transfer rate for two models

Model	m_v g/s	m_w g/s	h_{vi} kJ/kg	h_{vo} kJ/kg	h_{wi} kJ/kg	h_{wo} kJ/kg	Q W
T1	0.123	3.1133	2677.64	306.388	134.14	221.8	272.9
T2	0.0481	3.1133	2677.64	164.64	134.14	167.7	104.6

In this study, effect of flow arrangement on the heat transfer phenomena of the heat exchangers was also investigated. For the case done in this study, the two models had the same conditions: the temperature of saturated vapor was 101°C and the temperature of cooling water was 32 °C with mass flow rate of 3.159 g/s. Both heat exchangers were tested in the horizontal position. It was observed that the heat transfer rate obtained from the counter flow arrangement is always higher than that obtained from the parallel one: the value obtained from the counter flow arrangement is 1.04 to 1.05 times of that obtained from the parallel flow. The results for two phases are in good agreement with the results for single phase [10]; however, it is shown that the effect of flow arrangement in two phases is not stronger than single phase, as shown in Table 5.

Table 5. Heat transfer rate with counter flow and parallel flow arrangements

Model	m_v g/s	m_w g/s	Heat transfer rate Q, W	
			Counter flow	Parallel flow
T1	0.123	3.159	194,63	184,32
T2	0.0481	3.159	111.52	107.197

Figure 4 shows effect of the inlet cooling water temperature to the outlet temperatures of vapor and water for the microchannel heat exchanger T1. It is observed to see that when the inlet cooling water temperature increases, the outlet cooling water temperature increases; however, the temperature difference of cooling water is increasing slowly. As a result, the temperature difference of vapor side decreases or the condensing vapor temperature increases. It means that the condensation heat transfer efficiency in the microchannel heat exchangers decreases as increasing the inlet cooling water temperature, as shown in Fig.4.

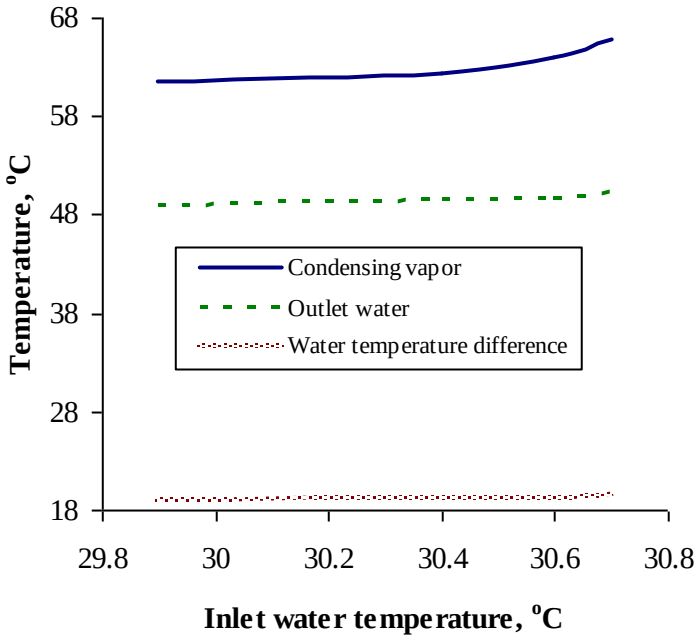


Fig. 4. Effect of the inlet cooling water temperature for heat exchanger T1

IV. CONCLUSION

Experimental work was done for the two microchannel heat exchangers with rectangular channels having hydraulic diameters of 375 µm and 265 µm to investigate condensation heat transfer. For the microchannel heat exchanger T1, the heat transfer rate of 272.9 W was achieved for the vapor having the inlet temperature of 101 ºC and the mass flow rate of 0.123 g/s and for the cooling water having the inlet temperature of 32ºC and mass flow rate of 3.1133 g/s. In this study the heat transfer rate obtained from the counter flow arrangement is always higher than that obtained from the parallel one: the value obtained from the counter flow arrangement is 1.04 to 1.05 times of that obtained from the parallel flow. The results for two phases are in good agreement with the results for single phase; however, it is shown that the effect of flow arrangement in two phases is not stronger than single phase. In addition, the condensation heat transfer efficiency of the microchannel heat exchanger decreases as increasing the inlet cooling water temperature.

ACKNOWLEDGMENT

The supports of this work by (1) the project (Project No. T2013-22TĐ /KHCN-GV) sponsored by the specific research fields at Hochiminh City University of Technical Education, Vietnam and (2) the project (Project No. 65-13/CTHT-NEPTECH) sponsored by New Product & Technology Center (NEPTECH) – Hochiminh City Department of Science and Technology of Vietnam, are deeply appreciated.

REFERENCES

[1] J.S. Hu and C.Y.H. Chao, An experimental study of the fluid flow and heat transfer characteristics in micro-condensers with slug-bubbly flow, International Journal of Refrigeration, Vol. 30, (2007), pp. 1309-1318

[2] C.Y. Park and P. Hrnjak, Experimental and numerical study on microchannel and round-tube condensers in a R410A residential air-conditioning system, International Journal of Refrigeration, Vol. 31, (2008), pp. 822-831

[3] Santiago Martínez-Ballester, José-M. Corberán, José Gonzálvez-Maciá, Numerical model for microchannel condensers and gas coolers: Part I e Model description and validation, International Journal of Refrigeration, Vol. 36, 2013, pp. 173-190

[4] H. Cho, D.Y. Hwang, B.S. Lee, and H.H Jo, Fabrication of micro condenser tube through direct extrusion, Journal of Materials Processing Technology, Vol. 187-188, (2007), pp. 645-648

[5] Jaehyeok Heo, Hanvit Park, and Rin Yun, Comparison of condensation heat transfer and pressure drop of CO_2 in rectangular microchannels, International Journal of Heat and Mass Transfer, Vol. 65, (2013), pp. 719–726

[6] J.R. García-Cascales, F. Vera-García, J. Gonzálvez-Macía, J.M. Corberán-Salvador, M.W. Johnson, and G.T. Kohler, Compact heat exchangers modeling: Condensation, International Journal of Refrigeration, Vol. 33, 2010, pp. 135-147

[7] P. Hrnjak and A.D. Litch, Microchannel heat exchangers for charge minimization in air-cooled ammonia condensers and chillers, International Journal of Refrigeration, Vol. 31, (2008), pp. 658-668

[8] T.T. Dang and J.T. Teng, Comparison on the heat transfer and pressure drop of the microchannel and minichannel heat exchangers, Heat and Mass Transfer, Vol, 47, 2011, pp. 1311-1322

[9] T.T. Dang and J.T. Teng, The effects of configurations on the performance of microchannel counter-flow heat exchangers – An experimental study, Applied Thermal Engineering, Vol. 31, Issue 17-18, 2011, pp. 3946-3955.

[10] T.T. Dang and J.T Teng, Influence of flow arrangement on the performance index for an aluminium microchannel heat exchanger, IAENG Transactions on Engineering Technologies Volume 5, the American Institute of Physics (AIP), Vol. 1285, 2010, pp. 576-590

[11] G. Goss Jr. and J.C. Passos, Heat transfer during the condensation of R134a inside eight parallel microchannels, International Journal of Heat and Mass Transfer, Vol. 59, pp. 2013, pp. 9–19

[12] Michael J. Moran, Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, John Wiley & Sons Ltd, England, 2006.

Survey Paper on Traditional Hadoop and Pipelined Map Reduce

Dhole Poonam B[1], Gunjal Baisa L[2]
[1]M.E.ComputerAVCOE, Sangamner, India
[2]Dept. of Computer Engg.AVCOE, Sangamner, India

ABSTRACT
Recent days Map Reduce programming model have shown great value in processing huge amount of data. Map Reduce is a common framework for data-intensive distributed computing of batch jobs. To modify fault tolerance, several implementations of Map Reduce go on the entire output of every map and Reduce task before it is consumed. During this paper, we are going to study a modified Map Reduce design that permits knowledge to be pipelined between Mapper and Reducer. This elaborates the Map Reduce programming model on the far side process execution, and can scale reduce completion times and improve system utilization for batch jobs in addition. The Study illustrates that the implementation of Pipelined Map Reduce will scale well and with efficiency method large data sets on artifact machines. In pipelined map reduce hadoop is modified in such way that it can send data directly from Mapper to reducer.

KEYWORDS:*Hadoop, Map-Reduce, Parallel Processing, Pipelined Map-Reduce.*

I. INTRODUCTION

Distributed process on a "cloud" a giant assortment of artifact computers, every with its own disk, connected through a network has enjoyed a lot of recent attention. The hardware is an infrastructure that supports information and task distribution and strong component-failure handling. Google's use of cloud computing, that employs the company's proprietary infrastructure, [1] and also the subsequent open supply Hadoop cloud computing infrastructure [2] have for the most part generated cloud computing attention. Each of those environments give data-processing capability by hosting questionable Map Reduce jobs, that do their work by sequencing through information keep on disk. The technique will increase scale by having an outsized variety of freelance (but loosely synchronized) computers running their own instantiations of the Map Reduce job elements on their information partition.

Map Reduce has emerged as a well-liked way to harness the ability of enormous clusters of computers. Map Reduce permits programmers to suppose during a data-centric fashion: they concentrate on applying transformations to sets of knowledge records, and permit the small print of distributed execution of task, network communication and fault tolerance to be handled by the Map Reduce framework. Map Reduce is often applied to batch-oriented computations that are related primarily with time to job deadline. The Google Map Reduce framework [5] and Hadoop system reinforce this usage model through a batch-processing implementation strategy: the whole output of every map and reduce task is materialized to a local file before it will be consumed by succeeding stage. Materialization permits for an easy and stylish checkpoint/restart fault tolerance mechanism that's vital in giant deployments that have a high probability of slowdowns or failures at worker nodes.We tend to propose a changed Map Reduce design in which intermediate information is pipelined between operators, where as conserving the programming interfaces and fault tolerance models of previous Map Reduce frameworks.

To validate this style, we tend to develop the Hadoop on-line prototype (HOP); a pipelining version of Hadoop Pipelining provides several important benefits to a Map Reduce framework:

I) Because of the reducers begin processing data as soon as it is produced by mappers, they can create and refine an approximation of their final answer at the time of execution. This is called as online aggregation [3]; it can give initial estimates of results several orders of magnitude at high efficiency than the final actual results.

II) Pipelining extends the domain of the problem to which Map Reduce can be applied. Continuously running Map Reduce job accept new data as its come and analyze it immediately. Applications like Event monitoring and stream processing can be handled by using pipelined Map Reduce.
III) Concept of pipelining send data to the succeeding operator which increases chances for parallelism, improve utilization and response time.

II. BACKGROUND

2.1 Programming Approach

To use Map Reduce, the computer programmer expresses their desired computation as a series of jobs. The input to job is associate input specification that may produce key-value pairs. Each job consists of two steps: initial, a user-defined map function is applied to every input record to provide listing of intermediate key-value pairs. Second, a user-defined reduces function called once for every distinct key in the map output and passed the list of intermediate values associated with that key. The Map Reduce programming model parallelizes the execution of those functions and ensures fault tolerance automatically. Optionally, the user can also provide combiner function [5]. Combiners are almost like to the reducer functions, except that they are not passed all the values for a given key: instead, a combiner emits associate output value that aggregates the input values it was passed. Combiner's are generally used to perform map-side "pre-aggregation," that reduces the amount of network traffic needed between the maps and reduce steps.

```
Public interface Mapper<K1, V1, K2, V2>
 {
Void map (K1 key, V1 value,
Output Collector<K2, V2> output);
Void close ();
}
```

2.2 Architecture of Hadoop

The Map Reduce programming model is designed to process large data set in parallel by distributing the Job into a various independent Tasks. The Job considered to here as a complete Map Reduce program, which is the execution of a Mapper or Reducer across a set of data. A Task is an executing a Mapper or Reducer on a chunks of the data. Then the Map Reduce Job normally splits the input data into independent portions, which are executed by the map tasks in a fully parallel fashion. The Hadoop Map Reduce framework consists of a one Master node that runs a Job tracker instance which takes Job requests from a client node and Slave nodes everyone running a Task Tracker instance. The Job tracker is responsible for distributing the job to the Slave nodes, scheduling the job's component tasks on the Task Trackers, monitoring them as well as reassigning tasks to the Task Trackers when they at the time of failure. It also provides the status and diagnostic information to the client. The task given by the Job tracker is executed by the Task Tracker. Fig. 1 depicts the different components of the Map Reduce framework.

2.3 HDFS

The HDFS has some desired options for enormous information parallel processing, such as: (1) work in commodity clusters in case of hardware failures, (2) access with streaming information, (3) dealing with big data set(4) use an easy coherency model, and (5) moveable across various hardware and software platforms. The HDFS [6] is designed as master/slave architecture (Fig. 2). A HDFS cluster consists of Name Node, a master node that manages the filing system name space and regulates access to files by clients. Additionally, there are various Data Nodes, usually one per node within the cluster, that manage storage connected to the nodes that they run on. HDFS exposes a filing system name space and permits user information to be hold on in files. Internally, a file is split into one or a lot of blocks and these blocks are stored in a set of Data Nodes. The Name Node executes filing system name space operations like gap, closing, and renaming files and directories. It determines the mapping of blocks to Data Nodes. Clients read and write request are served by the Data node. The Data Nodes is also responsible for block creation, deletion, and replication as per the instruction given by Name Node.

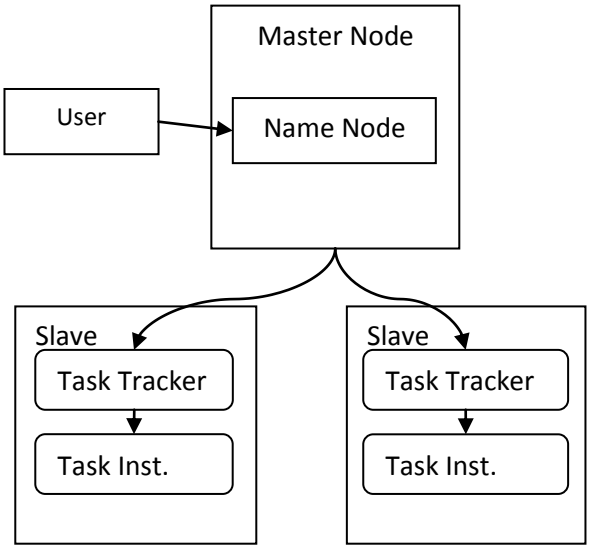


Figure 1: Hadoop Map Reduce

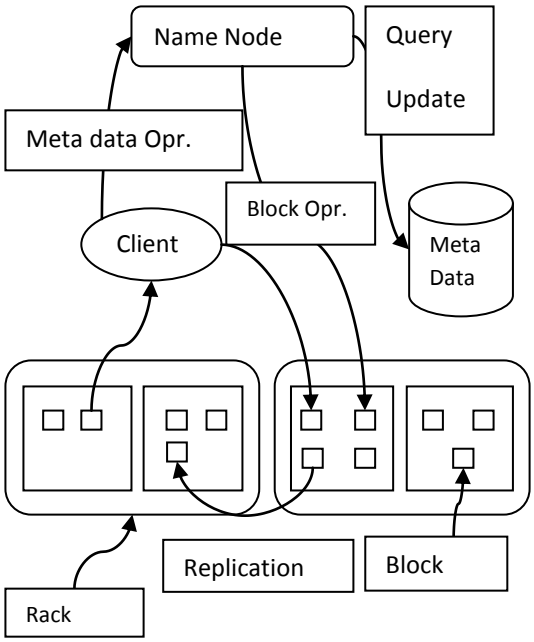


Figure2: HDFS Architecture

2.4 Execution of Map Task

Every map task is provided with a portion of the input file called as split. By default, a split contains a one HDFS block, so the total number of the number of map tasks is equal to the total number of file blocks. The execution of a map task is divided into two passes:

1) The map pass reads the task's split from HDFS, interpreted it into records (key/value pairs), and applies the map function to every record.
2) After applying map function to every input record, the commit phase stores the final output with the Task-Tracker, Then Task Tracker informs the Job-Tracker that the task has finished its execution. The map method specifies an Output Collector instance, which collects the output records created by the map function. The output of the map step is consumed by the reduce step, so that Output Collector stores output produce by mapper in a simpler format so that it is easy to consume for reduce task. By applying a partitioning function

intermediate key are assigned to reducers, so the Output Collector applies partition function to every key produced by the function map, and stores every record and partition number value in an in-memory buffer. The Output Collector spills this buffer to disk when buffer reaches its maximum capacity. At the time of commit phase, the final output of the map task is generated by merging all the spill files generated by this task into a single pair of data files and index files. These files are registered with the Task-Tracker before the completion of task. The Task-Tracker will read these data and index files when servicing requests from reduce tasks.

2.5 Execution Of Reduce Task

The execution of a reduce task is divided into three passes.

1) The shuffle phase is responsible for fetching the reduce task's input file. Each reduce task is appointed a partition of the key range generated by the map pass, so that the reduce task must receive the content of this partition from each map task's output.

2) The sort phase group together records having same key.

Public interface Reducer <K2, V2, K3, V3>

{Void Reduce (K2 key, Iterator<V2> values, Output Collector <K3, V3> output);

Void close ();}

3) The reduce phase appoint the user-defined reduce function to every key and corresponding list of values. Within the shuffle phase, a reduce task fetches data from every map task by sending HTTP requests to a configurable number of Task-Trackers at once .The Job-Tracker relays the location of each Task-Tracker that hosts map output to each Task-Tracker that executes a reduce task. Reduce task can't receive the output of a map task till the map has finished execution and committed its final output to disk. When receiving its partition from all map outputs, the reduce task enters into the sort phase. The map output for every partition is already sorted by the reduce key. The reduce task merges these outputs together to produce a single output that is sorted by key. After that task enters the reduce phase, in that it calls the user-defined reduce function for every distinct key in sorted order, passing it the associated list values list. The reduce function output is written to a temporary location on HDFS, When the reduce function has been applied to every key in the reduce task's partition .The output of both map and reduce tasks is written to disk before it can be consumed. This is normally expensive for reduce tasks, because output of both task is written to HDFS. Fault tolerance is simplified by output materialization, because it reduces the amount of state that must be restored to consistency at the time of a node failure. If any map or reduce task fails, the Job-Tracker simply schedules a new task to perform the same work as the failed task. Since a task never exports any data apart from its final answer, no additional recovery steps are needed.

III. ARCHITECTURE OF PIPELINED MAP REDUCE

In this section we are going to discuss extensions to Hadoop to support pipeline [4] .Figure 3 and 4 depicts data flow of two different Map Reduce implementations. The first data flow (fig 3) corresponds to the output materialization approach employed by Hadoop; the second dataflow (fig 4) on corresponds to pipelining and that we called it Pipelined-Map Reduce.

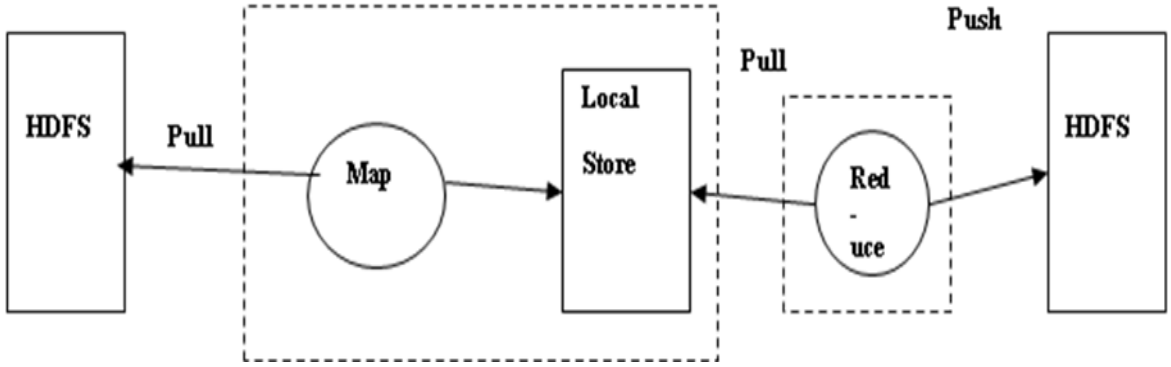


Figure 3: Hadoop data flow for batch

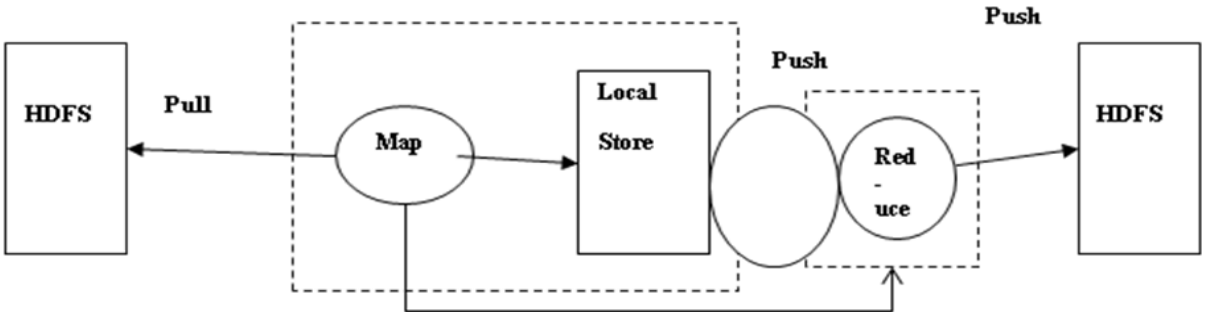


Figure4: Pipelined Map Reduce data flow

In general, reduce tasks traditionally send HTTP requests to pull their output from every Task Tracker. It means that map task execution is completely separated from reduce task execution. To support pipelining, the modification is done in the map task to instead push data to reducers as soon as it is generated. To give an intuition for how this is going to be work, we begin by studying a straight forward pipelined work flow, and then discuss the changes we have to make to achieve good performance. As per the paper Hadoop is modified to send data directly from map task to reduce task. When a client send a new job to HDFS, Job Tracker assigns the map task and reduce task associated with the job to the available Task Tracker slots. For the purpose of discussion, we consider that there are sufficient free Slots to assign all the tasks for every job. Due to the modified version of Hadoop every reduce task can contact to each map task at the time of initiation of the job, as well as it opens a TCP socket which will be used for pipelining the output of the map function. When every map output record is produced, the mapper determines to which partition (reduce task) the record should be sent, and immediately sends it through the appropriate sock. The pipelined data is received by the reduce task from every map task and it stores it in an in-memory buffer, it also spills the sorted outputs of the buffer to disk if needed. Whenever the reduce task learns that each map task has completed its work, it performs final merge operation of all the sorted outputs and applies the user defined reduce function, write the final output to the Hadoop Distributed File System.

IV. CONCLUSION

In this paper, we studied the Hadoop data flow and Pipelined Map Reduce data flow. Pipelined Map Reduce is much better than the traditional one. It reduces the completion time of tasks. That means the implementation of Pipeline Map Reduce can processes large datasets effectively.

REFERENCES

[1] J. Dean and S. Ghemawat, "Map Reduce: Simplified Data Processing on Large Clusters," Comm. ACM, vol. 51, no. 1, 2008, pp. 107–112.
[2] http://hadoop.apache.org
[3] HELLERSTEIN, J. M., HAAS, P. J., AND WANG, H. J. Online aggregation. In SIGMOD (1997).
[4] Tyson Condie, Neil Conway, Peter Alvaro, Joseph M. Hellerstein in the Proceedings of the 7th USENIX symposium on Networked Systems Design and Implementation (NSDI 2010), April 2010.
[5] DEAN, J., AND GHEMAWAT, and S. Map Reduce: Simplified data processing on large clusters. In OSDI (2004).
[6] D.Borthakur: The Hadoop Distributed File System: Architecture and Design (2007).

Performance Promoting Using E - management

[1]Huthaifa A.A. Ellatif, [2]Samani A. Talab
1. Faculty of Computer Sciences and Information Technology, Al-Neelain University, Ph. D in IT, Khartoum – Sudan.
2.Dean Faculty of Scientific Affairs, Al-Neelain University,– Khartoum – Sudan

Abstract
This paper discussing the E - management concept, and its special characteristics which lead to enhance personnel performance in many aspects, for instance quickly right decision making, in right way according to reaching results in fast way and exerted effort, as well shortening the time, enhancing personnel competency, monitoring their performance easily and participating in promoting their standard, all that by getting acquainted with New means, methods and techniques.This paper aims to show the significance of using the E - management, for its precise and authentic results that could be reliable in personnel performance acquaintance, the paper include a study on one of the foundations that shows the significance of turn to E - management.

Key Words*:E - Management, E-Government, Performance, E- Performance,Traditional Management,* perfect performance,*The E - management Characteristics*

I. INTRODUCTION

The 21th century facts indicates that the humanity civilization passing throw a new era known as Acquaintance Era, this era base on a basic column known as informatics which formed the distinguished feature of this era, and which transferred the world into a small electronic room despite the massive flow of information in so many fields (commercial, scientific, entertainment etc …) and the huge humanity intellectual product and the pressing need to exchange a lot of this information throw long distances.During the scientific and technological developments of this era, the official and private information institutions, with its different fields of specialization, should act in advance to drawing up the requisite plans and policies to promote an information and telecommunication technologies that should be linked with the national and world information networks, moreover training the scientific and technicalcadres whom specialized in information and its networks and the telecommunication techniques, in order to get a foothold in this technological revolution and provide sophisticated and fast information services to its personnel, hence it should be stopping the idea of traditional management and traditional measurement of performance, and go towards the E - management and the ongoing measurement of performance based on the electronic concepts[2][5].

II. PERFORMANCE

Performance is an achievement of results by predefined goals but we have to differentiate between a performance and another performance, every performance should have three things that known as performance triangle and measurement indications as it explained in the shape bellow:

Shape No. (1): Performance triangle and measurement indications

If the predefined goals had been fulfilled with a results this called efficiency,if the goals had been fulfilled with less used resources it is competency.
The used resources means:

- Time
- Human Resources
- Financial Resources

Certainly every performance be distinguished by the optimum use for the abovementioned resources, it is inevitable to indicate the performance maturity stairs as it explained in the shape bellow:

Shape No. (2): Maturity ladder performance

The lowest performance step at the stairs is theEffectiveness, which means doing work as usually had been done using same means.The step of Efficacy means that the performance been bound by presence of work strategy.However the Efficiencyphase is dependent to reaching results by using less available resources, as for high performance step is to start comparing the performance with others' performance (competitors) to achieve results better than others.The best step of performance is the excellent performance which means to achieve predefined goals according to distinct strategy, better than others, using less resources, maintains stable performance for a long time.The concept of performance had been changed due to the accelerating use of modern means and techniques, in the past the measurement of performance was calculated and evaluated within specific period of time, now a days performance been calculated in ongoing way and there are achievement statistics should be issued constantly to reach the right evaluation and adopting the right decisions.
It is inevitable to use the new and modern techniques, applying the E - management according to the concepts of (the E - management) which means using an electronic system enabling the authorized personnel to reach information easily and quickly, with cheap expense, that is the perfect performance, for its significance light upon the E - management will be on it in details in the next paragraphs [11].

III. INSUFFICIENCIES OF TRADITIONAL MANAGEMENT

There are many insufficiencies in the traditional managementincluding but limited to:

(1) The massive prerequisite papers, documents, paper forms and signatures when a service applicant deals with a Government Authority, all these papers does not serve any clear goal utility for the required service.

(2) Repetition of asking service applicants' same papers, documents and certificates at any Government Authority deal with, refusing to accredit what audited by another Government Authority before.

(3) The massive numbers of personnel whom working in thousands of financial units in central Government and local units whom carrying out repeated works do not adding a true value, for instance, the routine calculation of Government and private sector personnel salaries by determine the salary then adding allowances, financial units deduct tax and other deductions from salaries etc.Are computer experts and IT experts able to innovatessolutions that enable personnel to receive their net salaries electronically using smart cards?

(4) The massive number of the financial transactions between State ministries and the massive number of the personnel, whom working in follow up the settlement of accounts, while it possible to avoid all that by using automatic system regulate the financial relationships, for instance the Government electricity companies have considerable dues on the State administrative units and does not be attained that lead to accumulation of this debts, while it is possible to make a balancing in the budget once a year. The same repeats in all ministries what lead to wasting time and energies, and exhausting the financial resources with no added real value.

(5) Difficulty of disagreement and contradiction between figures and data that issued from different Government authorities like exports and imports figures, unemployment figures, gross domestic product growth average and local and foreign debts figures etc, applying the concept of smart Government(electronic)will root out this problem, by determine data sources and auditing it precisely before entering it to the system, moreover the possibility of the self auditing and self check in the comprehensive information system which discovers the contradiction between data and recover it immediately.

(6) Wasting of the huge national resources represented in the accumulated commodities stock in stores of the state due to non perfection of planning and controlling Governmental procurements, repeating purchase same items despite its existence in warehouses. The surveillance of commodity store in the State comprehensive data base moreover unifying the procurement unit and store management, resulting in better effectiveness in using the available resources.One of the important features of transferring towards the smart Government (electronic) is utilizing the unified national ID, by dealing with the Citizen in all State authorities using unified ID saving huge efforts and files, and that participate in quickness of accomplishing transactions reducing all expenses.

(7) Nature of the political regime: the majority of the managementproblems resulting from the political regime, that most people unaware of this issue, this lead to outbreak of nepotism and disorder, neglecting the principals of recruitment competency and reward and punishment.

(8) Non competency of personnel:this element is connected with the last reason, a considerable number of personnel are not specialized and dose not attend specialized training courses, and they had been chosen according to their political party membership, that lead to arbitrary transaction executing, non abidance of laws and disdaining people.

(9) Extreme bureaucracy: conceptunderstood for the bureaucracy is the extreme abidance the text of the law a step leads to hindering of the conducts and consequently root out the aim which for it the law was legislated while it is to facilitation of people transactions However, thebureaucracy is in most of Arabic countries is not resulting from abidance by the law" but is a result from a lawlessness a lot of the times and reliance of the improvisation in transactions to the extent that two similar transactions may be handled in different ways that for the (lawlessness) bureaucracy.

(10) Lack of the questioning: Systems of the supervision and the questionings in the administrative field are ineffective, in spite of the large number of the observation and punitive corporations inside the executive power, till now no violations had been stopped, and no mismanagement had been controlled. In addition that ministries does not reporting its activities every six months as per law stipulates which result in outbreak of the corruption and administrative negligence.

(11) Decrease of revenue: this affects the employees very much including employees with ethics and law commitment employees, pushing to acceptance of bribe to facilitates transactions, that what lead management to its current level.

(12) The strong administrative centralism: The general management structure complains about an effective strong centralism and an effective inconsequence between its managements on the central level and local managements[1][3][6].

IV. THE E - MANAGEMENTGOALS

The principal philosophy for the E - management is its view to the management as a resource for the services, and the citizen and the firms as clients desire the utilization from this services, certainly the E - management have many goals pursue for its realization as a part of dealings with the agent, mentioning a few irrespective of the importance and the priority:-

[1] Making cost of the measures little (the administrative) and its process.

[2] Increasing competency of management work through its dealings with citizens and firms and institutions.

[3] Serving more clients in same time, while the traditional management capability in carrying out clients' transaction is limited, what cause clients stay in a long queues.

[4] Cancellation of the direct relation between the two sides the transaction which lead to limitation of the personal relationship influences.

[5] Annulling paper archive system and substitute it by an electronic archive system for more flexibility and capability to correct errors quickly and expansion of documents for more than one department quickly, utilizing it any time.

[6] Rooting out the bureaucracy and its solid concept, facilitating work by dividing it and specializing in specific works.

[7] Cancellation of place factor, by making conversations between the employees, sending orders and instructions and held seminars through "video conferences" and through management electronic networks.

[8] Cancelling the effect of time factor, the concept of summer and winter seasons does not exist, also no existing of taking a leave to achieve transactions [7].

V. THE E - MANAGEMENT CHARACTERISTICS

Some of the E - management characteristics:

(1) Eliminating the organizational gap between the management at the top and the workers at the bottom.
(2) Cancelling the traditional division between the management (which takes the decision) and the workers (whom carrying out), and the consultant (who provides advice and recommendation).
(3) Re-portion of the roles and the positions that make the management which decision-maker to be turned into a consultant management (provide consultants which help to remove obstacles) or an executive management work to provide problems' solutions.
(4) Assuring the total quality management (TQM) principal with its modern concept, quality as it is defined in Oxford dictionary means the high degree of quality or value, the specialized American institution (O.D.I) defined the quality …. Is to accomplishing the right works in the right time, the E - management assuring the significance of fulfillment the work requirements in the time that client need the service.
(5) Simplifying the procedures and reduce the expense providing high quality service.
(6) Shortening the time of finalizing the administrative transactions.
(7) Accuracy and logical in achieved operations.
(8) Making communications easy between the institution departments and between the institution and other institution inside and outside the country.
(9) Reduce using papers in noticeable way that affects positively on the institution business. Those led to processing the problem of keep and authenticate the transactions[8].

VI. THE ELECTRONIC GOVERNMENT SUCCESS FACTORS

(1) Activation of the national educational committees' role towards the electronic Government.
(2) Promoting the technical cadres working in the electronic service field in all Governmental departments by training these cadres according to projects.
(3) Provide necessary experiences in business, IT, and communications.
(4) The positive, fruit able cooperation between the Governmental institutions in decision making about the electronic Government.
(5) Assurance of continuation of applying the strategy of electronic Government in consistency with the general sector and the programs strategies.
(6) The commitment of all Governmental departments with the policies, standards and technical criteria of the electronic Government.
(7) The most important factor is providing computers and internet service.
(8) Promotion and enlightenment for using the electronic services [5][6][7][8].

VII. REASONS TO TRANSFER TO THEE - MANAGEMENT

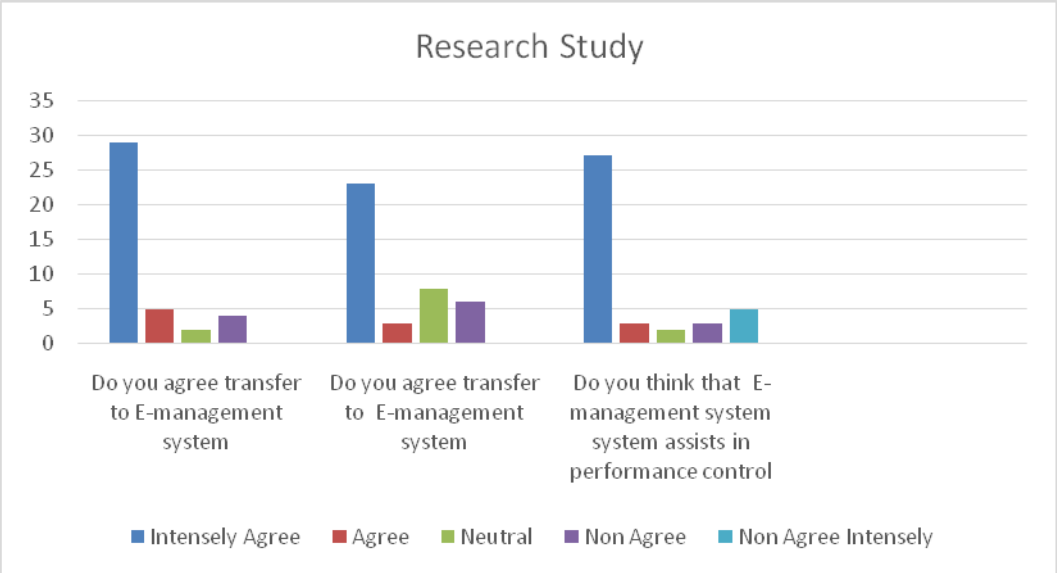
Transfer to the E - management not kind of entertainment it is inevitability imposed by world changes, the concept of integration, sharing and engaging information service become one of success factors for every institution. The scientific and technical progress imposed the administrative development towards the E - management. Time is considered one of the important factors. The reasons led to the transfer toward E - management could be summarized in the following points:

1. The complicated procedures and complicated operations and its effect on increase of business cost.
2. The instant decisions and instant recommendations which could cause an imbalance in the application.
3. The necessity of unification of data at the all levels of the institution.
4. Difficulty of theknowledge about performance measurement averages.
5. The necessity of providing the circulating data for the institution personnel.
6. Going to the technological employment of the development utilization and relying on the information in adopting the decisions.
7. The competition between institution increased, that require occurrence of distinctness mechanism in every institution pursue the competition.
8. Necessity of fulfilling the ongoing communication between the personnel on all business sectors.

VIII. RESEARCH STUDY

A research study had been made on a media institution on forty persons; its result was as follow:

S. N	Questionnaire	Intensely Agree	Agree	Neutral	Non agree	Non agree Intensely
1	Do you agree the transfer to E - management system	29	5	2	4	0
2	Do you think that theE - management system enhance the institution performance	23	3	8	6	0
3	Do you think that E - management system assists in performance control	27	3	2	3	5



IX. CONCLUSION

It is become clear that the best performance level is to attain the best results using predefined strategy with less resources and better than others', maintaining that level through times using the modern available means, to reach this level it is necessary to use the electronic concepts executing integrated electronic system for the management, following up the performance precisely.

REFERENCES

[1] D.SirefiMohammed, e-governanceHotelFacilities, DarthoughtUniversity, Alexandria, 2007.
[2] D. YassinSaadGhalib, management, and prospects forelectronicapplicationsArabia, King Fahd National Library, Riyadh, 2006.
[3] D. KurdAliMohammedIbrahim, Management and Leadership,andtheNileValleyfor Human Development, Cairo, 2011.
[4] D. Ahmed Maher,principlesofmanagementscienceandskill, University House, Alexandria, 2010.
[5] Aboud, FahdbinNasser,the practical application ofe-government e-Government, Obeikanlibrary, Riyadh,2008.
[6] AbuMgayd, YahyabinMuhammad, the e-governmentrevolutiononthetraditionaladministrative work, Riyadh, 2004.
[7] AbuSamira, Mahmoud, e-government, Doha, Qatar in 2001.
[8] MedhatRamadan, the criminal protectionfor e-commerce-a comparative study-, DarArabAlnhzh, Cairo, 2001 .
[9] Tariq Abdal-aliHammad, e-commerce, FacultyAltharh', Ain Shams University, 2004 .
[10] Mohammed Alcerega, e-governance, Beirut, 2004.
[11] D.idrisohlal , high performance , Effias Arabia, Moroco,2012.

Automation of JPEG Ghost Detection using Graph Based Segmentation

Archana V Mire[1], Dr S B Dhok[2], Dr P D Porey[1], Dr N J Mistry[1]
1 Dept of COED,SVNIT, Surat,
2 Dept of ECED VNIT, Nagpur

ABSTRACT:
As JPEG is widespread de facto image format, Most of the images available in computer systems, electronic devices and in the Web are in JPEG format hence forgery detection techniques in JPEG may explore most of the forgeries. As JPEG works on 8 by 8 block cosine transform most of the tampering correlation inherited by tampered image may get destroyed, making forgery detection difficult. In fact it is common practice followed by forger to hide traces of resampling & splicing. However the tampered region usually has a different JPEG compression history than the authentic region. JPEG ghost detection techniques makes use of artefacts introduced in image due to 8 by 8 block DCT transform. It identifies forgery by searching ghost which appears in resultant difference image after subtracting it from its various recompressed version at different quality levels. As number of difference images become very large it becomes difficult for human being to scan these large no of difference image. Hence in this paper we have proposed a technique which will automate ghost detection in image..

Keywords: JPEG, AJPEG, DJPEG, JPEG ghost, Segmentation, Automation, Difference image

I. INTRODUCTION

With the availability of high quality pirated photo editing software novice users are also able to create convincing image forgery creating big problems for authenticity of digital images. There are various techniques for detection of splicing in image based on inconsistencies of resampling[1][2][3], CFA interpolation[4][5], motion blurr[6], geometric property[7][8][9][10], chromatic aberration[11] & various survey paper [12][13][14] compared these techniques. But these techniques are very subjective to a specific type of forgery detection & performance degrades tremendously with post processing operations & compression. On contrary JPEG intrinsic fingerprint based techniques are more robust to compression. Original image on which forgery is created may be compressed or uncompressed similarly area pasted may belong to compressed or uncompressed image. Since both posses different compression history JPEG forgery detection techniques try to identify difference in compression history which may be in form of DCT block alignment or primary quantization table used. Farid's Ghost detection [15] approach is also based on these blocking artifacts introduced during recomression but it requires lot of human interaction. In this paper we have tried to automate identification of JPEG Ghost & thus avoided manual scanning of difference images. Before stating our automation algorithm we will briefly discuss types of JPEG forgery detection techniques & Farid's Ghost mechanism. JPEG based forgery detection can be broadly classified as below.

1.1 ADJPEG forgery detection

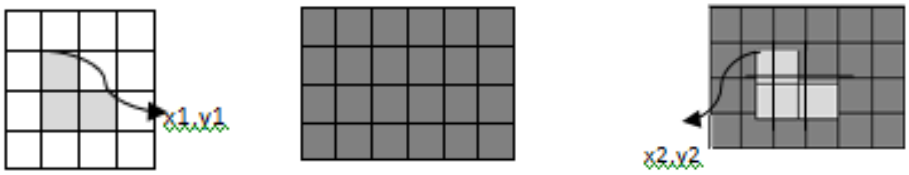
These techniques are dependent on the assumption that JPEG grid used in first compression & second compression shown in figure 1 is exactly aligned with each other satisfying equation (1), (2).

$$cx = (x1 \bmod 8) - (x2 \bmod 8) = 0 \quad \text{(Equ. 1)}$$

$$cy = (y1 \bmod 8) - (y2 \bmod 8) = 0 \quad \text{(Equ. 2)}$$

These techniques mostly identify double compression but not necessarily double compression mean forgery. These techniques can be applied to different objects in the image after segmentation & forgery can be traced out by objects having differing no of the compression history (objects having a single compression history are real & objects having a double compression history are forged).

Farid[16] analyzed ADPJPEG compression with 1D discretely sampled signal. They found that periodicity of the artifacts gets introduced into the histograms of double quantized signal which can be identified as spikes in the Fourier domain & gave complete theoretical proof of this phenomenon which can be used to identify forgery.



a.Source image b.Destination image c.Composite image

Figure 1. Example of JPEG Image forgery

1.2 NADJPEG forgery detection

These techniques are dependent on the assumption that JPEG grid used in first compression & second compression as shown in figure 1 is not aligned with each other satisfying equation (3), (4).

$$cx = (x1 \bmod 8) - (x2 \bmod 8) \neq 0 \quad \text{(Equ. 3)}$$

$$cy = (y1 \bmod 8) - (y2 \bmod 8) \neq 0 \quad \text{(Equ. 4)}$$

Since second compression is not aligned with the first, it is assumed that the original part of forged image exhibits regular blocking artifacts while the pasted one does not. These techniques mostly use linear characteristics of DCT coefficients & checks for all possible 8×8= 64 alignments in vertical & horizontal directions to maximize correlations.

Z Qu et al[17] denoted relation between input block Sm,n and output block $\hat{S}_{m,n}$ of non aligned JPEG double compression using equation (5). They expressed output block $\hat{S}_{m,n}$ as a linear mixture of four input blocks {Sm,n, Sm,n+1, Sm+1,n, Sm+1,n+1} that it overlaps.

$$\hat{S}_{m,n} = \sum_{i=0}^{1} \sum_{j=0}^{1} A_{cy,i} S_{m-i,n-j} A_{cx,j}^{T} + \hat{E}_{m,n} \quad \text{(Equ 5)}$$

Where $\hat{E}_{m,n}$ represents quantization noise of the second JPEG compression. $\{A_{cx,0}, A_{cx,1}, A_{cy,0}, A_{cy,1}\}$ represents set of mixing matrices. Their coefficients ware determined by the shifted distance (cx, cy) and the DCT transform matrix. De-mixing of Equation (5) supposed to be achieved when the NADJPEG image is shifted back to its original block segmentation.

In Ghost detection technique difference between given tampered image & its various compressed versions of different quality are searched for minima which appear as dark ghost. Since it is difficult for human being to scan all difference images, automation is achieved by coinciding ghost with one of the segmented object from image. As forgery is created by copying object from source image to destination image there are more chances that ghost will coincide with one of the object in image.

In section 2 we have restated Farid's ghost detection [15] & discussed difficulties in its implementation. In section 3 we have proposed Automation Algorithm & showed practical implementation in section 4. Finally we have concluded in section 5.

II. FARID'S GHOST DETECTION

Farid's ghost detection [15] is dependent on his experiment [16] in which a set of DCT JPEG coefficients c1 quantized by an amount q1 get subsequently quantized a second time by an amount q2 yielding coefficients c2, the difference between c1 and c2 is minimal when q2 = q1 and increases as the difference between q2 and q1 go on increasing (except if q2 = 1 i.e., no second quantization). Specifically, if q2 > q1 then the coefficients c2 become increasingly more sparse relative to c1, and if q2 < q1 then, even though the second quantization is less than the first, the coefficients c2 shift relative to c1. If each DCT coefficient is compared in

YCbCr channel differently, multiple minima may occur so they considered the cumulative effect of quantization on the underlying pixel values. In order to compensate between low & high frequency region present in image they considered spatially averaged and the normalized difference measure

Farid computed difference directly from the pixel values instead of computing the difference between the quantized DCT coefficients. Thus they avoided possible multiple minima at each color channel.

$$d(x, y, q) = \frac{1}{3}\sum_{i=1}^{3} [\, f(x, y, i) - f_q(x, y, i)]^2 \qquad \text{(Equ 6)}$$

Where f (x, y, i), i = 1, 2, 3, denotes each of three RGB color channels, and fq (·) is the result of compressing f (·) at quality q. Shown in the top left panel of the figure 2 is an image whose central 200×200 pixel region was extracted, compressed at a JPEG quality of 65/100, and re-inserted into the image whose original quality was 85. Shown in each subsequent panel is the sum of squared differences, Equation (6), between this manipulated image, and a re-saved version compressed at different JPEG qualities. Central region is clearly visible when the image is re-saved at the quality of the tampered region (65) and overall error reaches a minimum at the saved quality of 85.

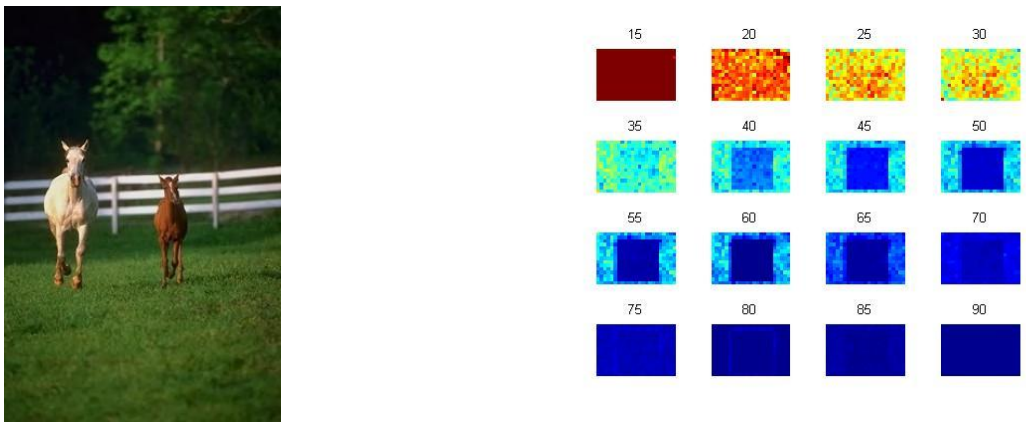


Figure 2. Difference images

In order to compensate effects of low & high frequency regions difference image is first averaged across a b × b pixel region by Equation(7) & then normalized as Equation (8) so that the averaged difference at each location (x,y) is scaled into the range[0,1].

$$\delta(x, y, q) = \frac{1}{3}\sum_{i=1}^{3} \frac{1}{b^2} \sum_{b_x=0}^{b-1} \sum_{b_y=0}^{b-1} [\, f(x + b_x, y + b_y, i) - f_q(x + b_x, y + b_y, i)]^2 \qquad \text{(Equ 7)}$$

$$d(x, y, q) = \frac{\delta(x, y, q) - \min_q [\delta(x, y, q)]}{\max_q [\delta(x, y, q)] - \min_q [\delta(x, y, q)]} \qquad \text{(Equ 8)}$$

III. EXPERIMENTAL EVALUATION OF GHOST DETECTION

Farid has given the result only for the forgery created from same image that too only central region was forged. Also the JPEG quality difference between central forged area & outer unforged area was minimum 20. When we tried to search for the ghost in blind forged images of CASIA Database V.2 [18] we observed following problems.

1. Theoretically Farid's [15] ghost mechanism is correct but practical implementation in same form is very difficult.
2. If quality of ghost image area (forged area) & surrounding image area is same ghost cannot be detected as everywhere in the forged image difference will come out as minimum.

3. If area of ghost region is very small as compared to complete forged image it becomes difficult to differentiate between actual ghost & other dark spot arriving because of actual low intensity values in original image..
4. If un-tampered image consists of low intensity area it may also come out as ghost since intensity difference in that area will be again very low. From above findings it is clear that we need a technique to identify whether a ghost is real ghost or it is arriving just because of low intensity area in an image. User needs to analyse multiple image at different compression quality for single forged image so it becomes very difficult to validate technique against huge forgery database.

   In practice, the amount of human interaction is extremely time consuming as a ghost can be visually hard to distinguish from noise & number of difference images can become very large

IV. PROPOSED GHOST AUTOMATION ALGORITHM

In this proposed algorithm first suspected image is segmented into different segments by using Graph based segmentation. Graph based method is based on selecting edges from a graph, where each pixel corresponds to a node in the graph, and certain neighbouring pixels are connected by undirected edges. Weights on each edge measure the dissimilarity between pixels. Technique adaptively adjusts the segmentation criterion based on the degree of variability in neighbouring regions of the image. Suspected image is recompressed at different quality levels & subtracted from original image. Subtraction is performed at each individual RGB color channel & effective average of three color channel is considered. Difference images are computed by using Farid's approach, morphologically processed & converted to black & white. If ghost appears in the resultant image it will come out as one large component whose size should not be too large to span complete image & too small to appear as noise throughout the image. So we considered only those difference images where size of component is greater than 1/8 of minimum size segment & less than twice of maximum size segment of original segmented image. All remaining difference images are discarded. This ghost will overlap with one of the segment we got during segmentation phase. If ghost size is within the range of corresponding segment size (here we have assumed it to be 5000 pixels) ghost is valid ghost & image identified as tampered. Complete Automation Algorithm is as given below.

Ghost Validation using Graph based Segmentation Algorithm (Image I)

1. Iseg= Graph_Seg (I) // Segment suspected Image I
2. Max_Segment_size= Size of Image segment with maximum size
3. Min_Segment_size= Size of image Segment with minimum size
4. Tampered=0
5. For q=1:Q // Quality of JPEG Image
   a. Recompress I at JPEG quality q to get image Iq
   b. I_b=I-I_q // Subtract recompressed image from original compresses image I.
   c. Average image Iq by moving b×b size window.
   d. Normalize the Iq between 0 to1
   e. Convert I_b to black & white Image
   f. Perform Opening in Image I_b
   g. ghost_size= Size of largest Component present in image I_b
   h. (If ghostsize>=Min_Segment_size/8 && ghostsize <= Max_Segment_size × 2)
      i. seg_ghost_size=segment size of Iseg overlapping with Ib
      ii. if |seg_ghost_size – ghostsize| <=5000
          tampered=1
      i. end-if
6. end-for

V. EXPERIMENTAL EVALUATION

We used CASIA V.2 [18] tampered image database for evaluation which consist of different types of images such as animal, architect, art, character, nature. One of the tampered image is as shown in rightmost image of figure3 which is created after splicing two rightmost images of figure3. Results at different stages of algorithm are shown from figure 4-6. Figure 4 represents segmented image we got after applying Graph based segmentation. Figure 5 represents difference images we got after subtracting image from different recompressed images. Figure 6 represents those difference images in which ghost is coinciding with segment of image. Figure 7 shows the final image in which ghost has the sufficient size compared to corresponding matching segment showing tampered area in image.

Figure 3. Creation of Tampered Image

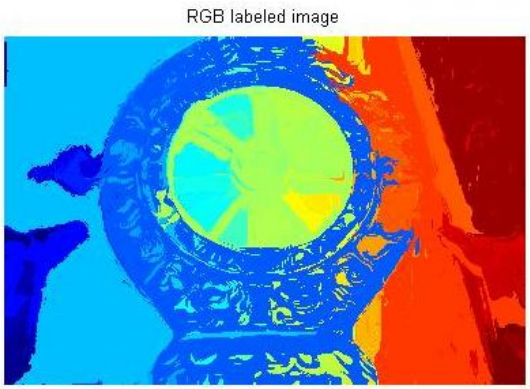


Figure 4. Segmented Image

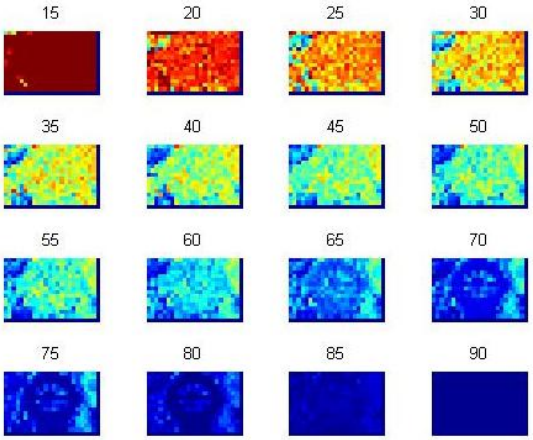


Figure 5. Difference Image

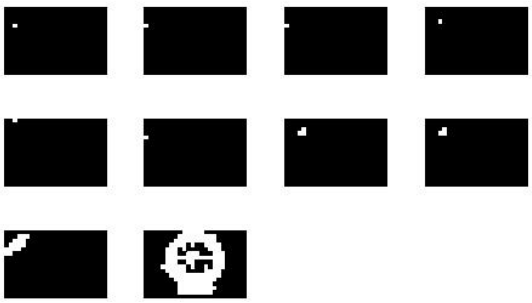


Figure 6. Difference Image Coincided with Segments of Image

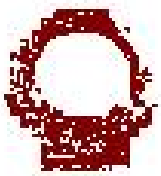


Figure 7. Automatically identified spliced Area

We have tested this algorithm against those JPEG images of CASIA tampered image database which are created by splicing two JPEG images. 80% of the images in which ghost (dark region) is manually visible in difference images ware detected automatically. But overall forgery detection rate was very poor. This occurs because in most of the tampered images pasted region undergoes NADJPEG compression so it doesn't come out as dark region rather it come out as lighter region as compared to surrounding region which undergo ADJPEG compression. Also in many images ghost doesn't arrive in difference images because of which forgery detection rate decreases.

VI. CONCLUSION

Here we have proposed a technique for automated ghost detection which will avoid user to scan large number of difference images. This technique will automatically give result as true or false & also will give forged area in image. In preliminary analysis we got 19 % false acceptance rate. As ghost is considered as small dark region in difference images some of the tampered images where surrounding area comes out as dark(undergo ADJPEG compression) while pasted region comes out as lighter area(undergo NADJPEG compression) & pass in automation process undetected. This drawback can be removed if intelligent approach for selection of ghost is considered (dark or light). In future we will try to classify ghost based on size of dark & light region which will improve False Rejection Rate.

REFERENCES

[1] A.C. Popescu and H. Farid, "Exposing digital forgeries by detecting traces of re-sampling," IEEE Transactions on Signal Processing, vol. 53, no. 2, pp. 758–767, 2005.

[2] B. Mahdian and S. Saic, "Blind authentication using periodic properties of interpolation," IEEE Transactions on Information Forensics and Security, vol. 3, no. 3, pp. 529–538, 2008.

[3] S. Prasad and K. R. Ramakrishnan, "On resampling detection and its application to image tampering," in Proceedings of the IEEE International Conference on Multimedia and Exposition, Toronto, Canada, 2006, pp.1325–1328.

[4] Sevinc Bayram,Husrev Sencar, Nasir Memon," Identifying Digital Cameras Using CFA Interpolation ", IFIP international Conference on Digital Forensics, Orlando, Florida , 2006 ,Volume 222, pp 289-299.

[5] Y. Long , Y. Huang, "Image based source camera identification using demosaicking", IEEE International Workshop on Multimedia Signal Processing, 2006, vol. 3 ,pp 419-424

[6] Kakar, P., Sudha, N. & Ser, W., "Exposing Digital Image Forgeries by Detecting Discrepancies in Motion Blur", IEEE Transactions on Multimedia, 2011, Vol. 13(3), pp. 443-452

[7] Q. Liu, X. Cao, C. Deng, and X. Guo, "Identifying image composites through shadow matte consistency," IEEE Transaction on Information. Forensics Security, vol. 6, no. 3, pp. 1111–1122, Sep. 2011.

[8] Criminisi, I. Reid, and A. Zisserman, "Single view metrology," Int. J. Computer Vision, vol. 40, no. 2, pp. 123–148, Nov. 2000.

[9] M. K. Johnson and H. Farid, "Detecting photographic composites of people," Proc. Int. Workshop on Digital Watermarking, Guangzhou, China, 2007.

[10] W. Zhang, X. Cao, Y. Qu, Y. Hou, H. Zhao, and C. Zhang,"Detecting and extracting the photo composites using planar homography and graph cut," IEEE Trans. Inf. Forensics Secur., vol. 5, pp. 544–555, Sep. 2010.

[11] M Johnson, H. Farid ,"Exposing digital forgeries through chromatic aberration" Proceeding of multimedia & security workshop , 2006,pp 48-55.

[12] Archana V. Mire, Dr S. B. Dhok, Dr N. J. Mistry, Dr P. D. Porey, "Catalogue of Digital Image Forgery Detection Techniques, An Overview ", in proceeding of Third International Conference on Advances in Information Technology and Mobile Communication – AIM 2013.

[13] Babak Mahdian, Stanislav Saic, "A bibliography on blind methods for identifying image forgery", Signal Processing: Image Communication 25 (2010) 389–399

[14] Hany Farid, "Image Forgery Detection, A survey", IEEE signal processing Magazine, March 2009

[15] H. Farid, "Exposing digital forgeries from JPEG ghosts", IEEE Trans. Inf. Forensics Security 4(1), 154–160 (2009).

[16] www.cs.dartmouth.edu/farid/downloads/.../digitalimageforensics .pdf

[17] Z. Qu, W. Luo, and J. Huang, "A convolutive mixing model for shifed double JPEG compression with application to passive image authentication," in Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '08), pp. 1661–1664, IEEE, Las Vegas, Nev, USA, March-April 2008.

[18] Casia Tampered Image Database V.2 http://forensics.idealtest.org:8080/index_v2.html

Design and Analysis of Industrial Helmet

[1]Anil Kumar. K, [2]Y. Suresh babu M.Tech
[1,2]Department of Mechanical Engineering, Rajiv Gandhi Memorial College of Engineering & Technology, Affiliated to J.N.T.University Anantapur, Nandyal,

ABSTRACT

All helmets attempt to protect the user's head by absorbing mechanical energy and protecting against penetration. Their structure and protective capacity are altered in high-energy impacts. Beside their energy-absorption capability, their volume and weight are also important issues, since higher volume and weight increase the injury risk for the user's head and neck. Every year many workers are killed or seriously injured in the construction industry as a result of head injuries. Wearing an appropriate safety helmet significantly reduces the risk of injury or even death. Protective headwear could save your life.

At present strength of the helmet using industry is less due to improper filling of material, uneven pressure distribution and blow holes. The aim of the project is to increase the strength of industrial helmet by making the modify material in existing one.

In order to achieve the objective of the project, the work is carried out in three stages.

In the first stage a parametric model is designed by using 3D modeling module in Pro-Engineer software. After designing the helmet, mould flow analysis is carried out on helmet by using plastic advisor which is a module in pro/E. Mould flow analysis is used for finding material filling, pressure distribution, air traps, and weld lines during the injection molding process at constant pressure and different temperature ranges.

In the second stage, after completion of the mould flow analysis impact analysis is done on industrial helmet by using COSMOS software for the three different type materials from different heights.

I. INTRODUCTION

1.1 Introduction to Helmet

A helmet is a form of protective gear worn on the head to protect it from Injuries. Ceremonial or symbolic helmets (e.g., English policeman's helmet) without protective function are sometimes used. The oldest known use of helmets was by Assyrian soldiers in 900BC, who wore thick leather or bronze helmets to protect the head from blunt object and sword blows and arrow strikes in combat. Soldiers still wear helmets, now often made from lightweight plastic materials.

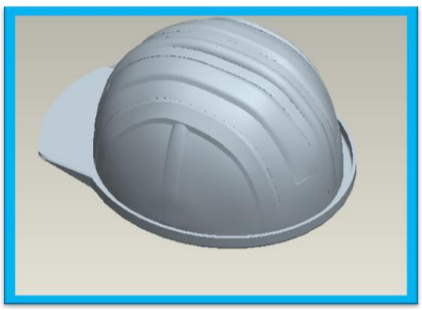


Figure 1.1 original model of industrial helmet

In civilian life, helmets are used for recreational activities and sports (e.g., jockeys in horse racing, American football, ice hockey, cricket, and rock climbing); dangerous work activities (e.g., construction, mining, riot police); and transportation. (e.g., Motorcycle helmets and bicycle helmets). Since the 1990s, most helmets are made from resin or plastic, which may be reinforced with fibers such as aramids.

All helmets attempt to protect the user's head by absorbing mechanical energy and protecting against penetration. Their structure and protective capacity are altered in high-energy impacts. Beside their energy-absorption capability, their volume and weight are also important issues, since higher volume and weight increase the injury risk for the user's head and neck. Anatomical helmets adapted to the inner head structure were invented by neurosurgeons at the end of the 20th century.

Helmets used for different purposes have different designs. For example, a bicycle helmet must protect against blunt impact forces from the wearer's head striking the road. A helmet designed for rock climbing must protect against heavy impact, and against objects such as small rocks and climbing equipment falling from above. Practical concerns also dictate helmet design: a bicycling helmet should be aerodynamic in shape and well ventilated, while a rock climbing helmet must be lightweight and small so that it does not interfere with climbing.

Some helmets have other protective elements attached to them, such as a face visors or goggles or a face cage, and ear plugs and other forms of protective headgear, and a communications system. Sports helmets may have an integrated metal face protector (face cage).

II. LITERATURE SURVEY

The literature towards the design methodologies, analysis techniques proposed by different authors is collected and presented in the subsequent paragraphs.

Franklin, Glen A.

The purpose of this study was to identify the impact of motorcycle helmet use on patient outcomes and cost of hospitalization, in a state with a mandatory helmet law.

Patients admitted after motorcycle crashes from July 1996 to October 2000 were reviewed, including demographics, Injury Severity Score, length of stay, injuries, outcome, helmet use, hospital cost data, and insurance information. Statistical analysis was performed comparing helmeted to un helmeted patients using analysis of variance, Student's test, and regression analysis.

Admitted 216 patients, 174 wore helmets and 42 did not. Injury Severity Score correlated with both length of stay and cost of hospitalization. Mortality was not significantly different in either group. Failure to wear a helmet significantly increased incidence of head injuries (Student's *t* test, $p < 0.02$), but not other injuries. Helmet use decreased mean cost of hospitalization by more than $6,000 per patient.

Failure to wear a helmet adds to the financial burden created by motorcycle-related injuries. Therefore, individuals who do not wear helmets should pay higher insurance premiums.

G M Ginsberg and D S Silverberg

Legislation requiring bicyclists to wear helmets in Israel will, over a helmet's 5-year duration (assuming 85% compliancy, 83.2% helmet efficiency for morbidity, and 70% helmet efficiency for mortality), save approximately 57 lives and result in approximately 2544 fewer hospitalizations; 13,355 and 26,634 fewer emergency room and ambulatory visits, respectively; and 832 and 115 fewer short-term and long-term rehabilitation cases, respectively. Total benefits ($60.7 million) from reductions in health service use ($44.2 million), work absences ($7.5 million), and mortality ($8.9 million) would exceed program costs ($20.1 million), resulting in a benefit-cost ratio of 3.01:1.

Syrotuik, Daniel G. Reid, David C.

There is lack of consensus among pre-hospital personnel (athletic therapists, paramedics, sport physiotherapists) concerning specific aspects of initial care and assessment of injured athletes presenting signs and symptoms of a cervical spine injury (CSI).

In instances of serious injury involving the head and/or spine, complicated by altered levels of consciousness, protective equipment such as helmets and shoulder pads may provide a hindrance to prompt, safe, and efficient management. Specifically, there is disagreement concerning the need or advisability of removing protective head gear, as in the case of football and hockey athletes. Using the technique of fluoroscopy, the cervical spine displacement of 21 male football and hockey athletes was determined while wearing protective shoulder pads and protective head equipment at the following times (a) during helmet removal, (b) during cervical collar application, and (c) as the helmetless head was allowed to rest.

Mohan J. Edirisinghe, Heidi M. Shaw and Katherine L. Tomkins

The yield stress of seven A16.SG alumina suspensions was estimated using shear stress-shear rate data measured at the processing temperature. Five of these were processed using a high molecular weight polypropylene binder system but each have a different %vol. of ceramic. The two other formulations contain a low molecular weight alcohol as the major binder. The relative viscosities of the A16.SG alumina-polypropylene compositions were used in an extended form of the Eilers equation to evaluate V_{max}, the maximum volume fraction of ceramic. The relative viscosities of three other alumina powders processed using the same polypropylene binder system were also investigated using the same equation in order to assess the effect of particle characteristics on V_{max}.

III. PLASTICS

A material consisting of very large molecules characterized by light weight, high corrosion resistance, high strength-to-weight ratios, and low melting points. Most plastics are easily shaped or formed.

3.1 Thermoplastic:

A thermoplastic, or thermo softening plastic, is a polymer that becomes pliable or moldable above a specific temperature, and returns to a solid state upon cooling.[1][2] Most thermoplastics have a high molecular weight. The polymer chains associate through intermolecular, which permit thermoplastics to be remolded because the intermolecular interactions increase upon cooling and restore the bulk properties. In this way, thermoplastics differ from thermosetting polymers, which form irreversible bonds during the curing process. Thermo sets often do not melt, but break down and do not reform upon cooling

3.1.1Types of Thermoplastic:

Acetal
Acrylics
Acrylonitrile-Butadiene-Styrene
Nylon
Polyamide- imide etc

3.2 Acrylonitrile butadiene styrene (ABS)

ABS is a common thermoplastic. Its glass transition temperature is approximately 105 °C (221 °F).[1] ABS is amorphous and therefore has no true melting point.

ABS is a terpolymer made by polymerizing styrene and acrylonitrile in the presence ofpolybutadiene. The proportions can vary from 15 to 35% acrylonitrile, 5 to 30% butadiene and 40 to 60% styrene. The result is a long chain of poly butadiene criss-crossed with shorter chains of poly(styrene-co-acrylonitrile). The nitrile groups from neighboring chains, being polar, attract each other and bind the chains together, making ABS stronger than pure polystyrene. The styrene gives the plastic a shiny, impervious surface. The butadiene, a rubbery substance, provides resilience even at low temperatures. For the majority of applications, ABS can be used between −20 and 80 °C (−4 and 176 °F) as its mechanical properties vary with temperature.[2] The properties are created by rubber toughening, where fine particles of elastomer are distributed throughout the rigid matrix.

3.3 Impact grade Acrylonitrile butadiene styrene (ABS)

Medium high Impact grade ABS is a common thermoplastic. Its glass transition temperature is approximately 105 °C (221 °F).[1] ABS is amorphous and therefore has no true melting point.
ABS is a terpolymer made by polymerizing styrene and acrylonitrile in the presence ofpolybutadiene. The proportions can vary from 15 to 35% acrylonitrile, 25 to 50% butadiene and 30 to 50% styrene. The result is a long chain of poly butadiene criss-crossed with shorter chains of poly(styrene-co-acrylonitrile). The nitrile groups from neighboring chains, being polar, attract each other and bind the chains together, making ABS stronger than pure polystyrene. If increasing of butadiene the impact grade ABS plastic more stronger than the ABS plastic. The styrene gives the plastic a shiny, impervious surface. The butadiene, a rubbery substance, provides resilience even at low temperatures. For the majority of applications, ABS can be used between −25 and 90 °C (−3 and 196 °F) as its mechanical properties vary with temperature.[2] The properties are created by rubber toughening, where fine particles of elastomer are distributed throughout the rigid matrix

3.4 Nylon 4-6 (polyamide):

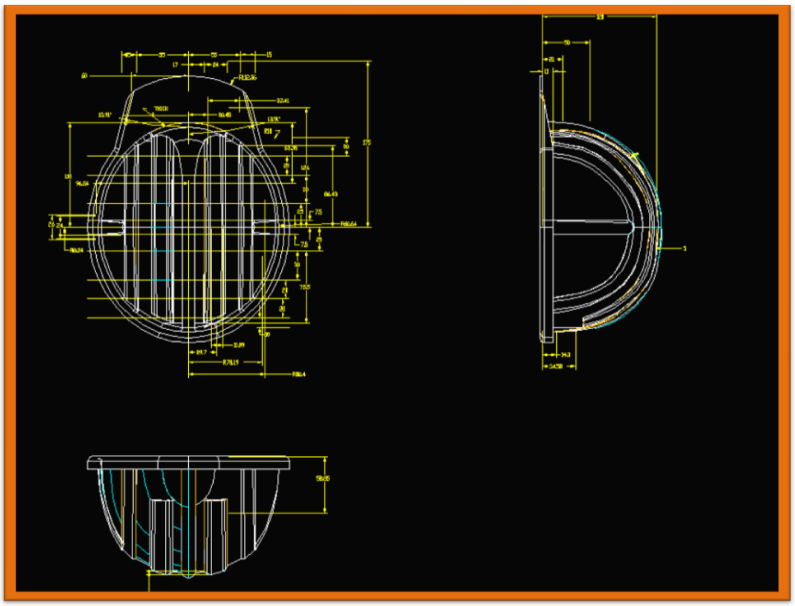
The name "nylons" refers to the group of plastics known as polyamides. Nylons are typified by amide groups (CONH) and encompass a range of material types (e.g. Nylon 6,6; Nylon 6,12; Nylon 4,6; Nylon 6; Nylon 12 etc.), providing an extremely broad range of available properties. Nylon is used in the production of film and fiber, but is also available as a moulding compound.

Nylon is formed by two methods. Dual numbers arise from the first, a condensation reaction between diamines and dibasic acids produces a nylon salt. The first number of the nylon type refers to the number of carbon atoms in the diamine, the second number is the quantity in the acid(e.g. nylon 6,12)

The second process involves opening up a monomer containing both amine and acid groups known as a lactam ring. The nylon identity is based on the number of atoms in the lactam monomer (e.g. nylon 4-6 or nylon 12 etc).

IV. MODELING AND MOULD FLOW ANALYSIS OF HELMET

Figure 4.1 2D Diagram of the industrial helmet



4.1 Design and manufacturing procedure of helmet

By using the fundamental abilities of the software with regards to the single data source Principle, it provides a rich set of tools in the manufacturing environment in the form of tooling design and simulated CNC machining and output. Tooling options cover specialty tools for molding, die-casting and progressive tooling design.

4.2 Different Modules in Pro/Engineer

1. Part Design
2. Assembly
3. Drawing
4. Sheet metal
5. Mould Design
6. Manufacturing

4.3 Model of Industrial Helmet

Industrial helmet is model by using Pro/E software, Figure 4.2, Figure 4.3 & Figure 4.4 gives the detailed explanation of the helmet modeled in Pro/E software

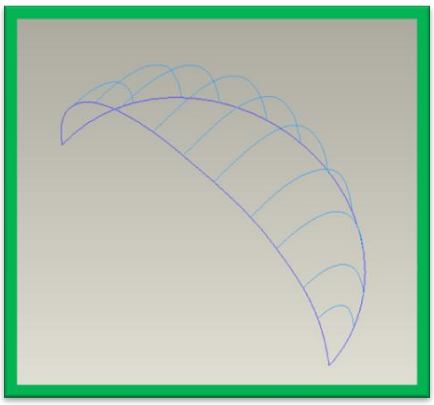


Figure 4.2 First Wire Frame Model

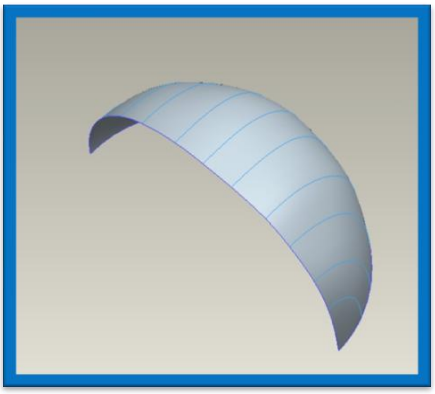


Figure 4.3 Surface Part

4.4 Plastic flow analysis

The Flow Analysis summary page gives an overview of the model's analysis, including information about actual injection time and pressure and whether weld lines and air traps are present. In addition, the dialog uses the Confidence of Fill result to assess the mould ability of the part. Figure 3.4 gives the information about the plastic flow analysis

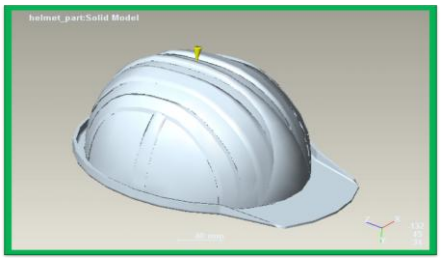


Figure 4.4 Solid model of the Helmet

4.5 Fill Time

This result shows the flow path of the plastic through the part by plotting contours which join regions filling at the same time. These contours are displayed in a range of colors from red, to indicate the first region to fill, through to blue to indicate the last region to fill. A short shot is a part of the model that did not fill, and will be displayed as translucent. By plotting these contours in time sequence, the impression is given of plastic actually flowing into the mould. Figure 3.5explains the fill time required for the helmet mould.

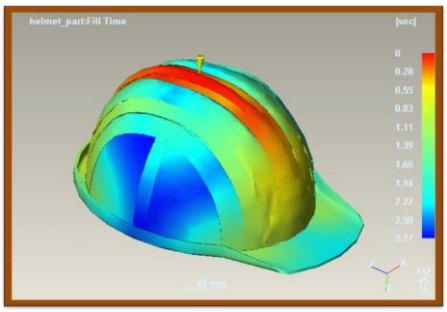


Figure 4.5 Fill time of Helmet

4.6 Confidence of Fill

The confidence of fill result displays the probability of a region within the cavity filling with plastic at conventional injection molding conditions. This result is derived from the pressure and temperature results. Figure 3.6 explains the confidence fill

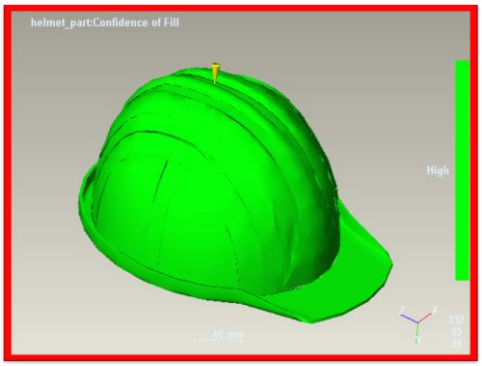


Figure 4.6 Confidence of fill of helmet

4.7 Quality Analysis

The Quality display is derived from combinations of the five results listed below. These five results are each divided into ranges - unacceptable (red), acceptable (yellow) and preferred (green). The five results are:

a) flow front temperature
b) pressure drop
c) cooling time
d) shear rate
e) shear stress

For each area of the cavity, the five results are evaluated. If all five results in an area are acceptable, the area is green. If there is at least one unacceptable result, the area is red. If there are both acceptable and preferred results, the area is yellow.

1. An area of the Quality result is green if all of these cases are true:

The flow front temperature (T) is between the minimum (T_{min}) and maximum (T_{max}) recommended temperatures for the material in the material database.	$T_{min} < T < T_{max}$
The pressure drop (P_{drop}) is in the range between 0% and 80% of the maximum injection pressure (P_{max}), as set in the Processing Conditions Tab of the Molding Parameters dialog.	$P_{drop} < (0.8P_{max})$
The cooling time (t) is less than 1.5 times the average cooling time for the part (t_{av})	$t < 1.5t_{av}$

2. One of these conditions is true: An area of the Quality result is yellow if none of the red conditions is true, and at least.

The flow front temperature (T) is between the minimum (T_{min}), recommended temperature for the material and a value 5°C above the maximum (T_{max}), recommended temperature for the material.	$T_{min} < T < (T_{max} + 5°C)$
The pressure drop (P_{drop}) lies in the range between 80% and 100% of the maximum injection pressure (P_{max}), as set in Processing Conditions Tab of the Molding Parameters dialog.	$(0.8P_{max}) < P_{drop} < P_{max}$
The cooling time (t) is between 1.5 and 5 times the average cooling time for the part.	$1.5t_{av} < t < 5t_{av}$

3. An area of the Quality result is red if at least one of these cases is true**:**

The flow front temperature (T) is more than 5°C above the maximum Maximum recommended temperature for material (T_{max})	$T > (T_{max} + 5°C)$
The pressure drop (P_{drop}) is greater than or equal to the maximum injection pressure (P_{max}), as set in Processing Conditions Tab of the Molding Parameters dialog.	$P_{drop} >= P_{max}$
The cooling time (t) is more than 5 times above the average cooling time for the part (t_{av}).	$t > 5t_{av}$

4.8 Important information about mould flow analysis

In this chapter mould flow analysis of helmets can be studied and also plastic flow analysis, filling time of helmets, pressure drop in helmet, injection pressure in helmet, flow front temperature and quality of helmet can be analyzed. By using this process manufacture of industrial helmet can be done without any failures.

The analysis results herein are believed to be reliable but are not to be construed as providing a warranty, including any warranty of merchantability or fitness for purpose, or representation for which Mould flow Corporation assumes legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information presented herein. Nothing herein is to be taken as permission, inducement, or recommendation by Mould flow Corporation to practice any patented invention without a license or in any way infringe upon the intellectual property rights of any other party.

V. ANALYSIS OF THE HELMET BY USING COSMOS SOFTWARE

5.1 Analysis Steps

Complete analysis study by performing the following steps:

a) Create a study defining its analysis type and options.
b) If needed, define parameters of your study.

Parameters could be a model dimension, a material property, a force value, or any other entity that you want to investigate its impact on the design

5.2 Impact analysis of Nylon 4-6 plastic when dropped from 2000m height

Properties of Nylon 4-6

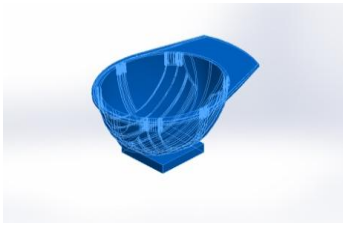
Model Reference	Properties	
	**Name:**	Default (4)
	Model type:	Linear Elastic Isotropic
	Default failure criterion:	Max von Mises Stress
	Yield strength:	2.5e+008 N/m^2
	Tensile strength:	3e+007 N/m^2
	Elastic modulus:	1.6e+010 N/m^2
	Poisson's ratio:	0.394
	Mass density:	1400 kg/m^3
	Shear modulus:	3.189e+008 N/m^2

Table 5.1 volumetric properties of helmet

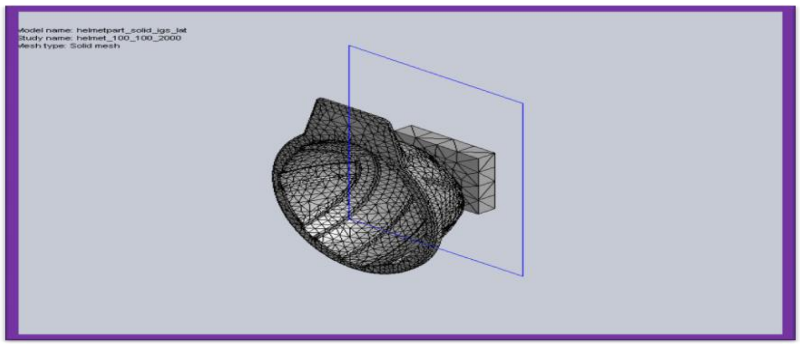


Fig: solid mesh of helmet

5.9.4 Results of Stresses developed in the helmet dropped from 2000mm height

Name	Type	Min	Max
Stress1	VON: von Mises Stress	6.06299e-015 N/mm^2 (MPa) Node: 193602	89.8404 N/mm^2 (MPa) Node: 185236

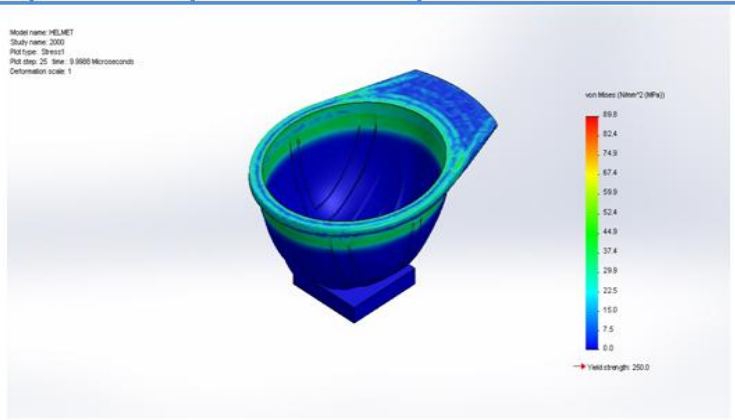
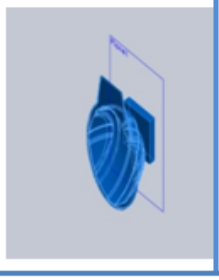


Figure:5.28 Results of Stresses developed in the helmet

Discussion: In the given above Figure 5.28 the blue color indicates the minimum level of strain and the red color indicates the maximum level of strain on helmet.

5.9.4 Results of displacement developed in the helmet dropped from 2000mm height

Document Name and Reference	Treated As	Volumetric Properties	Document Modified
Boss-Extrude2 	Solid Body	Mass:0.67312 kg Volume:0.000480804 m^3 Density:1400 kg/m^3 Weight:6.5965 N	D:\helmet\helmetpart_solid_igs_lat.SLDPRT

5.3 volumetric properties

5.9.5 Results of Displacement developed in the helmet dropped from 2000mm height.

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	3.32104e-005 mm Node: 31158	0.0620005 mm Node: 188935

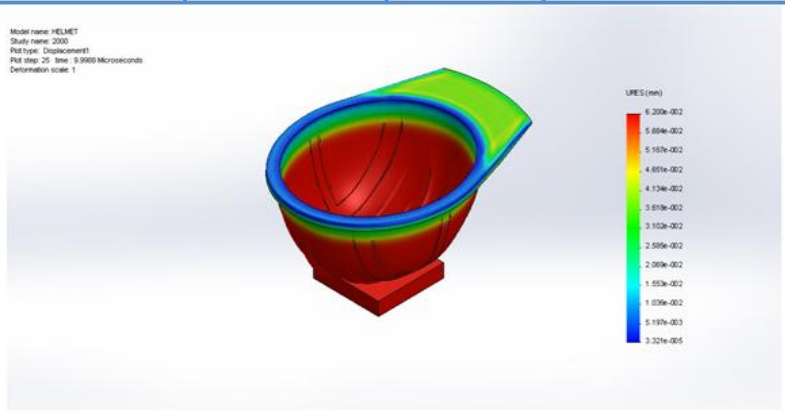


Figure:5.29 Results of displacement developed in the helmet

5.9.5 Results of Strain developed in the helmet dropped from 2000mm height.

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	3.67835e-019 Element: 119510	0.00442024 Element: 119409

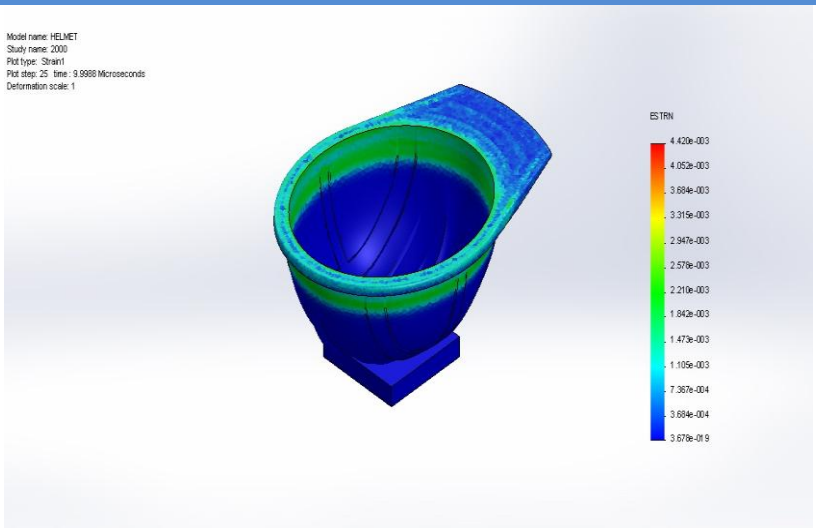


Figure:5.30 Results of Strains developed in the helmet

Discussion: In the given above Figure 5.30 the blue color indicates the minimum level of strain and the red color indicates the maximum level of strain on helmet.

VI. RESULT ANALYSIS

Impact analysis is carried out on the existing designed helmets by using COSMOS software and the results are tabulated as following

6.1.1 ABS Plastic

DISTANCES (mm)	STRESS (N/mm^2)	DISPLACEMENT (mm)	STRAIN	FOS
2000	17.1164	0.0309706	0.00746974	1.89
3000	21.1292	0.0382015	0.00922569	1.52
4000	23.8155	0.044087	0.0104911	1.25

6.1.2 Impact ABS Plastic

DISTANCES (mm)	STRESS (N/mm^2)	DISPLACEMENT (mm)	STRAIN	FOS
2000	23.6628	0.0310221	0.00710183	1.90
3000	29.2154	0.0382672	0.00877044	1.54
4000	33.3442	0.0440759	0.0100622	1.35

6.1.2 Impact ABS Plastic

DISTANCES (mm)	STRESS (N/MM^2)	DISPLACEMENT (MM)	STRAIN	FOS
2000mm	89.8	$6.200e^{-2}$	$4.420e^{-3}$	2.78
3000mm	97.98	$4.027e^{-2}$	$2.653e^{-2}$	2.55
4000mm	113.7	$4.667e^{-2}$	$5.355e^{-3}$	2.22

Stress produced in Nylon 4-6 plastic helmet is more than stresses produced in impact ABS plastic and ABS plastic helmet for different heights. It indicates that the resistance against the load per unit area, factor of safety is more, and with standing capacity of Nylon 4-6 plastic is more.

From the results it is proved that displacement produced in Nylon 4-6 plastic helmet is more than displacement produced in ABS plastic and impact ABS plastic helmet for different heights. It shows that the displacement of helmet cannot be altered to high and the impact of load on helmet is less.

Volumetric Strain produced in Nylon 4-6 plastic helmet is less than strain produced in ABS plastic and impact ABS plastic helmet for different heights, which gives more rigidity to the human neck from impact loads.

In this chapter, it is found that the Nylon 4-6 plastic is good instead of ABS plastic and impact ABS plastic helmet by using based on the above results.

ACKNOWLEDGEMENT

It is my privilege to express my profound gratitude and thanks to my guide **Y. Suresh Babu, M.Tech.** Asst**,** Professor in Mechanical Engineering, R.G.M College of Engineering and Technology, for his valuable guidance and encouragement throughout the course of this project work. Without his enthusiastic encouragement and support this work would most probably not have been completed.

I express my profound sense of gratitude and indebtedness to overall project work guide, **Dr: S. Altaf Hussain** Professor, Department of Mechanical Engineering, Rajiv Gandhi Memorial College of Engineering & Technology, Nandyal for his valuable guidance and suggestion to do my project

I earnestly express my deep sense gratitude and appreatiation to **Dr. K.THIRUPATHI REDDY, M.Tech, Ph.D.,** Professor and Head of the Department of Mechanical Engineering, R.G.M College of Engineering and Technology for providing all the lab facilities of Mechanical Engineering department and all kinds of support during the course of this study.

I take this opportunity to express my sincere thanks and indebtness to **Dr. T. JAYA CHANDRA PRASAD, M.Tech, Ph.D,.** Principal, R.G.M College of Engineering and Technology, Nandyal for cooperation throughout this project.

My special thanks to our chairman **Dr. M. SANTHI RAMUDU** chairman of the college for providing all amenities to complete our project work.

My thanks to **Smt. H. Deepthi**, Managing director of Win Will Technology for co-operation to complete this project work.

I would like express my heartful thanks to each and every **teaching and non- teaching staff members** of mechanical engineering department.

Finally I thankful to one and all who gave their whole hearted co-operation to complete this project work.

BIBLIOGRAPHY

[1.] Bair.s and Winer.W.O, "A technique for measuring helmet and follower skidding on automotive vehicals", Proceedings of the 17th Leeds-Lyon symposium of Tribology, September 4-7, 1990, Paper 6, tribology series 18, 1991, Elsevier.

[2.] Bas.H et al., "A new test apparatus for the tribological behaviour of analysis", Experimental techniques, September/October 2003, pp 28-32.

[3.] Bassani.R et al., "Experimental investigation of transient and thermal effects on lubricated non-conformal contacts", Tribotest, 2007, Vol. 13, pp 183-194.

[4.] Bayrakceken.H et al., "Fracture analysis of a helmet made from impact abs plastic", Original research article engineering failure analysis, December 2006, Vol. 13, Issue 8, pp 1240-1245

[5.] Belofsky, H., Plastics: Product Design and Process Engineering, Hanser Publishers, Munich, Vienna, New York, 1995.

[6.] Cardona.A et al., "injection moulding process", 2002, vol. 7, pp 285-305

[7.] Chakraborty.J and Dhande.S.G, "Kinematics and geometry of planar and spatial mechanisms", 1977, (John Wiley, New York).

[8.] Design data book**:** P.S.G.College of Technology (Kalaikathir achchagam), "Aluminum Properties" edition: 2007.

[9.] Gangopadhya.A et al., "Evaluation of tribological performance of ceramic roller follower", 1990, SAE 900401.

[10.] Greenham.G and Catterley.T, "scoter helmet: (Manganese Bronze powder metals Group, Ipswich, England)", Powder metallurgy, 1991, Vol. 34, No 2, pp 119-125.

[11.] Injection mould design: R.G.W. PYE (East-West press Pvt. Ltd), Edition2000 pp-2.

[12.] Lin.Y and Pisano.A, "Three-dimensional dynamic simulation of football helmet", 1990, Trans. ASME, J.Mech. Des., Vol.112, pp 529-537

[13.] Lens.E and Nigro.N, "Optimal design of helmet", Multibody system dynamics, 2002, issue 7, pp 285-305.

[14.] Levent cenk kumrouglu, "Mechanical properties of abs plastic helmet: Experimental and computer aided evaluation", Original research article materials and design, April 2009, Vol. 30, Issue 4, pp 927-938.

[15.] M.E. Gomes, A.S. Ribeiro, P.B. Malafaya, R.L. Reis and A.M. Cunha Department of Polymer Engineering, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

[16.] Müller, P. Kauranen , A. von Ganski and B. Hell SGL Technologies GmbH, VTT Technical Research, Centre of Finland.

[17.] Mohan J. Edirisinghe, Heidi M. Shaw and Katherine L. Tomkins Department of Materials Technology, Brunel University, Uxbridge, Middx, UK, UB8 3PH.

[18.] Norton.R.L, "The helmet design and manufacturing handbook", The Industrial Press, New York, 2002.

[19.] Per Lindholm, et al., "Characterisation a industrial helmet follower system in a construction field", Original research article, October 2003, Vol. 254, Issue 11, pp 1199-1207.

[20.] Progelhof, R.C. and J.L. Throne, "Polymer Engineering Principles: Properties, Processes,

[21.] and Tests for Design", Hanser Publishers, New York, 1993.

[22.] Prinsen, Rosanne K. E. M.Sc.; Syrotuik, Daniel G. Ph.D.; Reid, David C. M.D.

[23.] W. D. Brouwer , E. C. F. C. van Herpt and M. Labordus Centre of Lightweight Structures TUD-TNO, Kluyverweg 1, Delft 2629 HS, The Netherlands.

[24.] Zhu.G and Taylor.C.M., "Tribological analysis and design of a modern bicycle helmet follower, Wiltshire, UK: polymer Engineering Publishing, 2001, ISBN 1-86058-203-6.

Geographic Routing In Vanets: A Study

Jyoti Sindhu[1], Dinesh Singh[2]
[1,2]Department of Computer Science and Engineering,
Deenbandhu Chhotu Ram University of Science and Technology, Murthal (India)

ABSTRACT

Vehicle Ad hoc Networks are extremely mobile wireless ad hoc networks aimed to support vehicular safety and other viable applications. Vehicle-to-Vehicle (V2V) communication is significant in providing a high degree of safety and convenience to drivers and passengers. Routing in VANET is an important issue. Due to dynamic nature of the vehicles, the networks topological changes are very frequent and hence Position based routing protocols are found to be more suitable to VANETs. In VANETs, Position based routing protocols are used for routing messages in greedy forwarding way. In this study, an evaluation of the existing position based routing protocols in VANETs has been carried out. Different characteristics used for evaluation includes forwarding strategy, recovery strategy, position information and mobility management

KEYWORDS—*VANETs, beacon message, DGRP, A-STAR, VGRS, GPCR, GSR.*

I. INTRODUCTION

Road accidents cause loss of materials and even lives. Accidents are caused mainly because of violation of traffic rules. If we would be able to perfectly perceive the violation of these rules, then its sure that there will be lesser accidents and traffic will be managed more efficiently. Therefore, due to the necessity of the hour and also because of the existence of advanced network technologies, communication community have recently proposed the concept of Vehicular Ad hoc Networks (VANETs). VANETs are a category of ad hoc networks that is aimed to monitor the traffic, which enables the vehicles communication and help in better implementation of traffic rules hence accidents are reduced and the traffic can be managed more efficiently. VANETs are helpful in improving the transportation system, increasing safety of moving vehicles and are also helpful in providing other applications of desire to moving vehicles. Existing wireless networks can also be integrated with these networks to enhance the connectivity while moving. An overabundance of applications concerning to accident aversion, traffic efficiency and infotainment are also enabled with the commercial establishment of vehicular networks. VANETs resemble the operation technology of MANETs in the sense that process of self-organization and self-management criteria remains the same. However, high speed, uncertain mobility and hard delay constraints of the mobile nodes travelling along fixed paths are the differentiating characteristic of VANETs. The rest of this article is organised as follows. In section II various existing Routing protocols in VANETs are explained. Section III specifically Position based routing protocols are elaborated in detail. Finally in section IV a comparison and discussion of the existing geographical based routing techniques have been carried out.

II. ROUTING PROTOCOLS IN VANETS

Routing in VANETs can be broadly classified into: position based/geographic routing, cluster based routing, broadcast routing and geo-cast based routing. In cluster based routing each cluster is represented by a cluster head. Inter-cluster communication is carried through cluster heads whereas intra-cluster communication is carried through direct links. COIN[1] and LORA-CBF[2] are a few examples of this category. Broadcast based routing protocols include simple flooding techniques or selective forwarding schemes to counter the network congestion. BROADCOMM[3] and HV-TRADE[4] are examples of broadcast based routing protocols. Geocast based routing is location based multicast routing protocol. Each node delivers the message to other nodes that lie within a specified predefined geographic region based on ZOR(Zone of Relevance). The philosophy is that the sender node need not deliver the packet to nodes beyond the ZOR. GeoCast[5] and GeoTORA[6] are some examples of the geocast routing techniques. Position based/geographic routing employs the awareness of a vehicle about the position of other vehicles to develop a routing strategy. Previously proposed position based/geographic routing protocols include A-STAR[7], GSR[8], GPSR[9], GPCR[10], DGRP[11] and VGRS[12]. In this paper position based routing protocols are discussed further in more details.

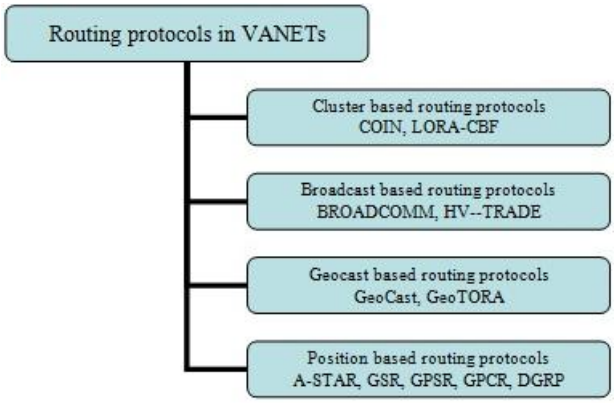


Figure: Categories of routing protocols in VANETs

A. Position Based Routing Challenges

VANETs have certain unique characteristics which make the position based routing in VANETs quite a challenging task[13]. The topology of VANET is highly dynamic owing to the movement of vehicles at very high speed. When two vehicles are exchanging information at such a high speed, frequent disconnection takes place, which make the communication between the vehicles very challenging. The mobility pattern also adds to the challenges as it is very random and depends on traffic environment, roads structure, the speed of vehicles, driver's driving behaviour etc. etc.. The communication environment also keeps on changing between dense and sparse, hence, the routing approach is quite different in both the scenarios. All these challenges add up to make position based routing quite difficult in VANETs.

III. POSITION BASED ROUTING

Following are the various Positions based routing techniques available in VANETs:

A. Greedy Perimeter Stateless Routing

Greedy Perimeter Stateless Routing (GPSR) [9] is one of the most important protocols of position based routing. In this approach, greedy forwarding method is used in which the neighbour closest to the destination is used for forwarding the packet. All the devices are equipped with GPS, which provides the current location of the nodes and helps in packet forwarding decision. Each node has information about nodes current position and also its neighbours and the neighbours also assist in making the packet forwarding decision. GPSR protocol is devised into two parts, one is the greedy forwarding and the other is perimeter forwarding. In greedy forwarding, the node that is closest to the destination is used to send the data. As the sender node knows the destination node, so the greedy nodes are chosen (nodes closer to destination) till the packet is delivered to the destination. Perimeter forwarding is used where the greedy forwarding fails that is where there no node closest to the destination. In other words we can say that when no next hop closest neighbour is available for forwarding the data packet, the perimeter forwarding is used. In perimeter forwarding, the nodes in void region are used to forward the packet to the destination making the use of right hand rule. In "right hand rule" [9], the paths are traversed in the clockwise direction in the void regions in order to reach the destination.

Besides some of its characteristics, GPSR suffers from several drawbacks. In case of the vehicular nodes, the greedy forwarding method is highly unsuitable owing to their high mobility. To maintain the next hop neighbour information is very difficult, as it may go out of range. As a consequence it will lead to the packet loss. GPSR suffers from another problem that is the beacons, which may be lost due to channel destruction or bad signal. As a result it can lead to removal of neighbouring formation from location table [14].

As a repair strategy when greedy forwarding fails, GSPR uses planarized graphs. But these too perform well only in highway scenarios where there are no radio obstacles [8]. In case of existence of radio obstacles, their distributed nature may lead to certain partitions of network and may lead to packet delivery impossible. Hence there is a need of position based routing protocols that merge position information with the road topological structure, to make vehicular communication possible in presence of radio obstacles.

B. Geographic Source Routing-GSR

GPSR encounters problems in the presence of the radio obstacles; therefore, there arises a need of a better position routing protocol that can overcome this problem. Geographic Source Routing (GSR) is proposed to solve the same [8]. This routing protocol deals with the problem of the high mobility of the nodes and also makes the use of the road map information. GSR uses "Reactive Location Service (RLS)" to find the destination node. Both the geographic routing and the road route information are used to deal with problem of the radio obstacles in GSR [8]. In case of the highway area where there are lesser obstacles in between the direct communication of the nodes, GPSR works well, whereas in case of city area numbers of obstacles are more which may create problems in direct communication among nodes. Therefore, GSR routing was proposed to deal with challenges faced by GPSR in city environment. In city area also there are two main challenges one is the dealing with the mobility issue of the vehicles and the other is the topological structure of the roads [8]. In GSR the second challenge is dealt by the use of the road map in making the routing decisions. Nowadays the vehicles come equipped with the GPS so making the use of the map routing decision is easy. RLS is used for position discovery in reactive position-based routing which works on the principle of the request and reply method. A source node broadcasts a message "position request" with some identification of the destination node. When a node with the same identification as contained in the broadcasted message receive it, will reply to it with the "position reply" message along with its current location information [8]. The sender node uses the road topology map to find the shortest route to the destination. In GSR the source node finds the shortest path to destination on the graph using simple graph algorithms [16] and mark the packet with destination´s location. In this the packet travels through junctions to reach the destination. GSR use "switch back to greedy" method for local recovery [15].

C. Anchor-based Street and Traffic Aware Routing- A-STAR

Anchor-based Street and Traffic Aware Routing (A-STAR) is one of the position based routing protocol that is developed keeping the city environment in consideration. Routing in city area is a very challenging task owing to the fact that big buildings cover almost all roads and streets. These challenges are being dealt to some extent with the help of the GSR as discussed in the previous section. In A-STAR, two routing schemes are used together that is anchor based routing and spatial based routing [16]. In anchor based routing, before transmitting the packet, the source node adds the source address and the information of the entire intermediate node junction in the header that the packet must travel to reach the destination [16]. Spatial based routing is the routing based on the city map and the road information. Spatial awareness is used to get topology information and different nodes position in the network. Mostly anchor based routing and spatial aware routing are used together [16]. In position based routing, every node sends its current position by a beacon message and every node knows its neighbour nodes. When a source sends message to the destination, it uses the geographic location of the destination.

In case of the city scenario when a source node wants to send data packet to destination, there are buildings between source and destination and there is no node closer to destination. In case of GPSR, the path to the destination is selected on the basis of the right hand rule only and no shorter route is considered. Packets traverse hop-by-hop until it finds a node nearer to the destination. This way of routing is not efficient in terms of time or processing. Both GSR and A-STAR are proposed for the city scenarios. Both of these compute the number of junctions to reach the destination but in addition to these, A-STAR also uses street awareness and traffic information in route finding [17]. In street awareness, A-STAR gets the anchor information according to the street map. A-STAR has two new features in addition to the GSR that makes its working quite different. It uses statistically and dynamically rated maps to find the number of junctions. In case of the statistically rated maps, A-STAR makes the use of the route map of the buses in order to ensure the high connectivity. In dynamically rated maps, A-STAR makes the use of the latest information of traffic to compute the number of junctions to compute the path to destination. For example consider the case where some roads are wider than other so there is more traffic. It means that connectivity is high on wider roads with high traffic (more vehicles). Using this traffic information A-Star assign the weight to the street [17] e.g. more vehicles less weight and less vehicles more weight. The junctions calculated dynamically by this method are more accurate [16].

In case of the city environment the recovery strategies of both the GPSR and GSR i.e. perimeter mode and switch back to the greedy method are inefficient. A-STAR makes use of a new recovery strategy. In A-STAR, the junctions are marked "out of service" and "operational" depending on the junctions able to route the packet to the destination. When a packet faces problem to pass through a junction, that junction is marked as "out of service" and other packets are restricted to traverse that junction until that junction changed to "Operational" state [16]. Whenever a junction is out of order all the nodes in the network are informed about it and their routing tables and city maps are updated with this information so that no node will use that junction as anchor to be traverse to reach destination. In future, when that node becomes operational, all the nodes are again informed about it and their routing tables are updated and that junction may be used for routing in future depending on the requirements. So as compared to other position based routing protocols, A-STAR adopts higher connectivity anchor based paths to find the route towards destination in large city environments.

D. Greedy Perimeter Coordinator Routing-GPCR

Greedy Perimeter Coordinator Routing (GPCR) [10] is another position-based routing protocol. It makes the use of the planar graphs. The streets and the junctions in city form planar graphs. Instead of using the static street maps or any other global or external information like the one used in A-STAR and GSR, GPCR makes the use of the natural planar graphs formed by the streets and junctions. It consists of two processes, one is the main procedure of forwarding the packet that is called as restricted greedy forwarding procedure and the other is the repair strategy, which is based on the topology of real-world streets and junctions so there is no need of graph planarization algorithm as the one used in GPSR. Restricted greedy forwarding is a special case of the greedy forwarding. In the city scenario as the buildings or the obstacles block the signal to be transmitted through, the data packets are routed along the streets only. So in that case the junctions are the only place where the actual routing takes place. The strategy should always be to forward the packet to the node at the junction instead of through the junction. The nodes present at the junction are called as *coordinator* [10]. Whenever a node becomes a coordinator it broadcasts its role that is as being a coordinator and its current location to the other nodes in the network. Depending on the forwarding node is a coordinator or not there are two ways of forwarding. If the forwarding node isn't a coordinator then the packet is forwarded along the street to the next junction. The forwarding node selects those neighbors who lie on the line of extension between the forwarding node itself and its predecessor. Out of these qualified nodes if still there is no coordinator then the next node is chosen on the basis of greedy method in which the node, which is most far from the forwarding node is chosen. If among the nodes in the line of extension is also a coordinator node then one of the coordinator node is chosen randomly. Following this method the packet won't be forwarded across the junction. So now the packet is with the coordinator node, and the decision is to be made as to which street to follow. The neighboring node with the largest progress towards the destination is chosen. This implies a decision on the street that the packet should follow. Although there are lots of improvements in the restricted greedy routing over the greedy routing of the earlier protocols discussed but still there are chances that the packet might get struck in the local maximum. So this requires a repair strategy. The repair strategies of the earlier protocols were based on the graph planarization algorithm based on the connectivity of the individual nodes. This doesn't form any natural planar graph but instead in case of the GPCR the recovery strategy is based on the natural planar graph formed by the street and the junctions. As a result of this the repair strategy of GPCR consists of two parts one is on each junction it has to be decided which street the packet should follow next and the second one in between junctions greedy routing to the next junction, as described above, can be used. If the forwarding node for a packet in repair mode is located on a junction (i.e., it is a coordinator) then the node needs to determine which street the packet should follow next. To this end, the topology of the city is regarded as a planar graph and the well known right-hand rule [9] is applied.

E. Directional Greedy Routing Protocol-DGRP

It is like GPSR in the way it uses two forwarding strategies greedy and perimeter. But unlike GPSR its decision of next hop doesn't only depend on one hop neighbour location information but also their speed and direction of motion. To get the most accurate current position of the nodes, GPSR need to send the beacon message very frequently. But owing to the high speed of the vehicles there are still chances of packet dropping no matter how frequently the packet is sent. In DGRP [11], speed and direction are also taken into account to predict the most accurate next hop neighbour so that the chances of packet dropping are least. It makes the use of the location prediction method in which each node can find its speed and direction information provided by GPS. This information is passed to 1-hop neighbours in beacon packets. Each node updates its neighbour's information in its neighbouring table from these beacons [11]. For example, if position of the node X at time t_0 is (x_a, y_a) and at time $(t_0 + t_b)$ is (x_b, y_b), where t_b is beacon interval, then direction and speed of A can be found using the following equations,

$$\Theta_A = \tan^{-1} Y_b\text{-}Y_a / X_b\text{-}X_a \qquad (1)$$

$$Speed_X = ((X_b\text{-}X_a)^2 + (Y_b\text{-}Y_a)^2)^{1/2} / t_b \qquad (2)$$

Node A can find the current position of (X_c, Y_c) of node Y at time t_1 using the information available in the neighbouring table as follows:

$$X_c = X_c' + speed_Y * (t_1 - t_0) * \cos(\Theta_Y) \qquad (3)$$

$$Y_c = Y_c' + speed_Y * (t_1 - t_0) * \sin(\Theta_Y) \qquad (4)$$

Where, $speed_Y$: indicates the speed of node Y, t_0: previous position update time, and (X_c', Y_c') : position of node at time t_0. In this way each node can predict the location of any of its 1-hope neighbours, irrespective of the beacon interval. This leads to reduction in accurate location problem and number of the retransmissions.

F. Novel Geographic Routing Strategy-NGRS

Like DGRP, VGRS[12] also broadcasts the beacon messages periodically to obtain the information of the neighbouring vehicles. The beacon message consists of position, velocity, and direction as acquired by GPS. When a vehicle knows that it is located at the intersection, it broadcasts a beacon message to inform its neighbouring vehicles. The routing takes place in two scenarios, whether the node is at straight road or on the intersection. In case of the straight road scenario, the greedy forwarding is used. But the greedy forwarding in this case is different from the greedy forwarding in case of GPSR. In this case the concept of vector is used to choose the next hop so that accuracy can be improved. In case of the intersection node the greedy mode is changed to the predictive mode. This protocol suffers from the local maximum problem for which right hand rule is used to forward the packet to the intersection for the decision-making.

IV. DISCUSSION AND CONCLUSION

In the previous sections, we discuss extensively the various position based routing protocols in VANETs given the challenges identified in their environments. Now, we revisit the routing protocols proposed for VANETs that were surveyed in Section III and summarize and compare the properties they can achieve in Table I. From this table, we can conclude that there is a gradual improvement in the routing protocols but none of the protocols have developed an effective routing strategy.

Evaluation Strategy	GPSR	GSR	A-STAR	GPCR	DGRP	VGRS
Forwarding strategy	Greedy forwarding	Reactive location service	Anchor based routing	Restricted greedy routing	Greedy forwarding	Greedy mode (straight road) and predictive mode (intersection)
Recovery strategy	Right hand rule	Greedy mode	New anchor path	No use of planar graph	Perimeter mode	Right hand rule
Position information	Packet forwarding	Message broadcasting	Traffic awareness rated map	Beacon message (position)	Beacon message (position, velocity, direction)	Beacon message (position, velocity, direction)
Mobility movement	Random wave point	Optimal velocity model	M-grid model of Manhattan	Real city scenario	Manhattan mobility model	MOVE, SUMO

TABLE 1: COMPARISON OF ROUTING PROTOCOLS

REFERENCES

[1] Blum J, Eskandarian A and Hoffman L,"Mobility managementin ivc networks", Proceedings of IEEE Intelligent VehiclesSymposium, pp. 150–155, 2003.
RA Santos, A Edwards and O Alvarez, "Towards an Inter-Vehicle Communication Algorithm", Proc. of *3rd International Conference onElectrical and Electronics Engineering, pp. 402-406, 2005*.

[2] Durresi, M., Durresi, A., and Barolli, L.,"Emergency Broadcast Protocol for Inter-Vehicle Communications"*;* Proc. *11th International ICPADS Conference Workshops,pp. 402-406, 2005*.

[3] Sun, M., Feng, W., Lai, T., et al, "GPS-Based Message Broadcasting for Inter-vehicle Communication"; Proc. of the *International* Conference on Parallel Processing, pp. 279-286, 2000.
J. C. Navas and T. Imielinski*;* "Geocast – geographic addressing and routing", Proc. of *ACM/IEEE Int. Conf. on Mobile Computing and Networking (MobiCom'97), September 1997*..

[4] Y. Ko and N.H. Vaidya, "GeoTORA: A protocol for geocasting in mobile ad hoc networks", *Proc. of the 8th International Conference on Network Protocols, November 2000*.

[5] Boon-Chong Seet, Genping Liu, Bu-Sung Lee, Chuan-HengFoh, Kai-Juan Wong, and Keok-Kee Lee,"A-STAR: A Mobile Ad Hoc Routing Strategy for Metropolis Vehicular Communications",Networking Technologies, Services, and Protocols; *Performance of Computer and Communication Networks, Mobile and Wireless Communications, pp. 989-999, 2004*.

[6] Lochert C, Hartenstein H, Tian J, Fussler H, Hermann D, and Mauve M,"A Routing Strategy for Vehicular Ad Hoc Networks in City Environments", Proc. of *IEEE Intelligent Vehicles Symposium*, pp. 156-161, 2003.

[7] Karp, B. and Kung, H.T.,"Greedy Perimeter Stateless Routing for Wireless Networks", Proceedings of the *Sixth Annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom 2000)*, pp. 243-254, Boston, MA, August, 2000.

[8] Christian, L.; Martin, M.,HolgerFüßler.; Hannes, H.; "Geographic Routing in City Scenarios", Proceedings of *ACM SIGMOBILE Mobile Computing and Communications Review*, Vol. 9, No. 1, pp. 69-72, January 2005.

[9] Kumar, R., Rao, S.V., "Directional Greedy Routing Protocol (DGRP) in Mobile Ad-Hoc Networks", Proc. of *Information Technology, ICIT '08*,pp.183 – 188, Dec. 2008.

[10] Yan-Bo Wang, Tin-Yu Wu, Wei-Tsong Lee, Chih-Heng Ke, "A Novel Geographic Routing Strategy Over Vanet", IEEE 24th International Conference on Advanced Information Networking and Applications Workshops, 2010.

[11] Jie Zhang " A Study on Trust Management for VANETs" , school of computer engineering, Nanyang technological university.

[12] Lochert, C., Mauve, M., Füßler, H., and Hartenstein, H., "Geographic routing in city scenarios" *SIGMOBILE Mob. Comput. Commun. Rev.* 9, 1 (Jan. 2005), pp. 69-72.

[13] G. Bellinger. "Modeling & Simulation," Internet: http://www.systems-thinking.org/modsim/modsim.htm, April 19, 2010.

[14] J. Tian, I. Stepanov, and K. Rothermel, "Spatial Aware Geographic Forwarding for Mobile Ad Hoc Networks", *Proc. MobiHoc, Lausanne*, Switzerland, Jun. 2002.

[15] F. Li and Y. Wang, "Routing in Vehicular Ad Hoc Networks: A Survey", *IEEE Vehicular Technology Magazine*, vol. 2, no. 2, pp. 12-22, Jun. 2007

A Survey on MR Brain Image Segmentation Using SOM Based Strategies

Jesna M[1], Kumudha Raimond[2]
[1]PG Student, Department of Computer Science and Engineering, Karunya University, Tamil Nadu, India,
[2]Professor, Department of Computer Science and Engineering, Karunya University, Tamil Nadu, India

Abstract:
Magnetic Resonance (MR) image segmentation has greater influence in image guided surgery, therapy evaluation and diagnosis fields. Several supervised and unsupervised segmentation techniques are available for image segmentation. Supervised segmentation has less demand in medical field because it needs a priori knowledge, assistance from external entity. Whereas unsupervised segmentation yield good results without any a priori knowledge. Self Organizing Map (SOM) is an unsupervised clustering technique. The SOM is an Artificial Neural Network (ANN) which has a feed-forward structure. The SOM features are very useful in data analysis and data visualization, which makes it as an important tool in brain MR image segmentation. SOM map quality depends upon the learning parameters, map topology and map size. A comprehensive survey on SOM based automatic MR image segmentation methods are presented below.

Keywords: *Image segmentation, MR brain image, self organizing map, unsupervised segmentation.*

I. INTRODUCTION

Magnetic Resonance Imaging (MRI) is a medical imaging technique which gives detailed information about internal tissue structures. High resolution and non-invasive MR images have a crucial influence in image analysis and diagnosis field. So, the MR image segmentation has even more importance.

Segmentation is defined as the process of drawing an imaginary line in an image, making image as collection of several regions having same properties. Neuro-anatomical structures within the medical images are identified by MR image segmentation. MR brain image segmentation is used to separate the soft brain tissues like White Matter (WM), Gray Matter (GM) and Cerebral Spinal Fluid (CSF). All the non recognized tissues are considered as pathological tissues. Radiologist uses segmentation results to identify neurological diseases.

Different approaches have been developed for brain MRI segmentation. Mainly segmentation can be addressed in two ways. First one is manual segmentation technique which depends on experience and knowledge of human experts but it is a time consuming and tiring process. Later one aims to use automatic and semi automatic techniques for imaging segmentation. Some of them are based on image histogram. Histogram-based segmentation method uses intensity levels of pixel. It is a fast method, but they do not make use of the spatial information and fail under noisy conditions. On the other hand, segmentation has been addressed by edge detection and region growing methods. Edge detection methods identify edges of objects which may fail when images are blurred or too complex to identify border. Region growing algorithms focus on the spatial information but they need initial input manually.

Clustering by supervised and unsupervised learning [1] is considered as the most popular segmentation technique. In supervised segmentation, a priori knowledge about segmentation is used. On the other hand, in unsupervised technique inherent features extracted from the image is used for the segmentation. Unsupervised segmentation based on clustering includes K-means, Fuzzy C-Means (FCM) and ANN. K-means algorithm is a hard segmentation method because it assigns a pixel to a class or does not [2]. FCM uses a membership function so that a pixel can belongs to several clusters having different degree [3]. ANN can change their responses according to the environmental conditions and learn from the experience. SOM is an unsupervised ANN that uses competitive learning algorithm.

II. SELF ORGANIZING MAP

SOM developed by Kohonen [4] is a strong candidate in image processing, data mining and pattern recognition. SOM maps high dimensional input data to one or two low dimensional data grids. SOM has a feed-forward structure. It contains a set of input nodes and output nodes. Each input node is connected to the output node via adjustable weight vector and is updated in each unsupervised iterative process. During each iteration, weight vector of the unit closest to the input node becomes the winning unit or best matching unit (BMU). SOM also uses a neighbouring function, so that nodes neighbor to the BMU also gets updated.

SOM algorithm proposed by Kohonen consists of 4 phases and is summarized in Fig.1. First phase is the initialization phase, where weight vectors are initialized by random initialization or data analysis based initialization methods [5]. In competition phase, node with smallest Euclidean distance is considered as the winning unit. Winning neuron excites the neighbouring neurons in cooperation phase and the weights of neighbouring nodes are updated. For this purpose Gaussian neighborhood function is used. Last phase is known as learning process where winning unit and neighbouring units are adjusted with the input pattern.

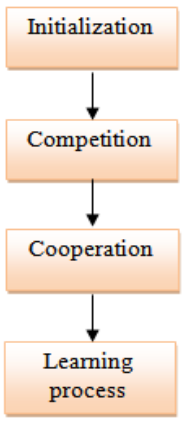


Fig.1: SOM modeling Phases

Unsupervised execution of SOM helps to identify the Alzheimer's, brain tumors, dementia and schizophrenia. SOM also used for the segmentation of mammogram images using multi-scale analysis [6]. and identifying dominant color component in medical image [7].

One of the most important features of SOM is topology preservation; nearby data in the input space is mapped onto neighbouring location in the output space. Quantization error and topological error [8] can be used to quantify goodness of the map. Quantization error measures the average distance between the data vectors and BMU and topological error measures the ratio of data vectors for which first and second BMU are not adjacent units. For an optimal quality map, quantization error and topological error need to be less. The smaller quantization error means data vectors are closer to its prototype.

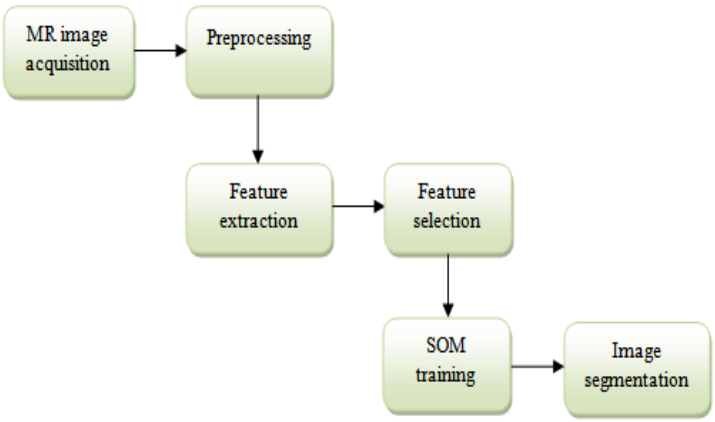


Fig.2: Steps in SOM based segmentation

MR image segmentation based on SOM follows six steps for the segmentation as shown in Fig.2. Initially MR image is acquired from an image source. The external objects in image such as noise and background are removed by using preprocessing stage. Several preprocessing algorithms have been developed such as brain surface extraction, brain extraction tool and hybrid watershed algorithm. From the preprocessed image, a set of discriminative features are extracted in order to train the SOM. Feature extraction is applied to reduce the dimensionality of the dataset used for SOM learning. In some cases, feature selection is performed after the extraction of features. To achieve good performance of SOM, small number of discriminative features is required. Genetic algorithm (GA), Principle Component Analysis (PCA) and various optimization algorithms are used in feature selection stage. These features are mapped to output nodes. SOM training gives a lower dimensional output map. Unsupervised segmentation using SOM requires, clustering the SOM output units after training. This can be addressed using the standard clustering algorithm like K-means, FCM and Learning Vector Quantization (LVQ).

III. ANALYSIS OF DIFFERENT SOM BASED SEGMENTATION TECHNIQUES

To improve the results of MR brain image segmentation several researches are being carried out by experts. Segmentation of MR brain images using SOM and performance metrics used for their evaluation are described in the following section.

3.1. Performance Metrics

Performance measurement of MR brain image segmentation is a difficult task due to the complexity of neuro-anatomical structures, quality of imaging techniques and characteristics of segmentation. Tanimoto performance index and Dice similarity metric which are associated with specificity and sensitivity used for evaluating the performance of segmentation algorithms [9].

Tanimoto coefficient measure the overlap that ground truth and segmentation results share with their attributes. Tanimoto index of value 1.0 means that results are very similar with ground truth and 0.0 means they share no similarity. Tanimoto similarity measure calculated as the size of the intersection divided by size of the union of the ground truth and segmentation result [13].

$$T = \left| \frac{A \cap B}{A \cup B} \right| \tag{1}$$

Dice similarity metric is calculated as two times the size of union divided by sum of the size of the ground truth and segmentation result.

$$D = 2 \frac{|A \cap B|}{|A| + |B|} \tag{2}$$

Where A is the automatically segmented region and B is the manually segmented brain MR image.

.

3.2. SOM with Markov Random Field

Y. Li et al. [10] uses the SOM network to segment the MR brain image. To improve the segmentation results algorithm includes spatial information regarding size, shape, and orientation of regions to be segmented by using Markov Random Field (MRF) model. MRF helps to produce better results without extra data samples in the training set. MRF term is not considered as an important factor in the segmentation process instead it helps to eliminate the effect of noise and to make smoothened segmented regions. Segmentation performance is measured by using mean squared errors.

3.3. HFS-SOM and EGS-SOM

A. Ortiz et al. [11] proposed two fully unsupervised MR brain image segmentation techniques. First one is referred as Histogram based Fast Segmentation (HFS-SOM) that depends upon the features selected from the histogram of the image. Features extracted consist of intensity occurrence probabilities, the relative position regarding the intensity value, the mean of the probability values over a 3-bins window and the variance of that window. These features are used to form a feature vector and used to train the SOM. The SOM output layer is further classified using K-means, to define the border between the clusters. HFS-SOM is a faster segmentation method because it does not require any parameter setup. The second method is known as Entropy Gradient Segmentation (EGS-SOM) which depends upon the statistical features such as first order, second order and

moment invariants extracted from the image slices. To reduce the number of features selected, feature selection process is performed by means of GA. The optimized output of GA is used for training the SOM. SOM outputs are further clustered using an efficient EGS algorithm. EGS-SOM is robust under noisy and bad intensity conditions and provides good segmented results with high resolution images.

Real MR brain images from Internet Brain Segmentation Repository (IBSR) are used for the segmentation. The performance evaluation is carried out by using tanimoto performance matrix. Tanimoto performance index shows that HFS-SOM has mean and standard deviation of 0.60 ± 0.1 for WM, 0.60 ± 0.15 for GM and 0.22 ± 0.08 for CSF. Corresponding value for EGS–SOM is 0.70 ± 0.04 for WM, 0.70 ± 0.04 for GM and0.1 ± 0.05 for CSF.

3.4. SOM and Knowledge Based Expert System

Knowledge based expert systems are used in the situations where experts are needed such as for analysis and diagnosis. In [12], SOM and knowledge based system are combined for medical image segmentation. In this method, feature vector elements are formed by extracting image intensities, first order features and second order features. Then a PCA is used to select the discriminative set of features from the extracted feature set. PCA is mainly used to identifying patterns in data and highlight the similarities and differences in data. The selected feature vectors are used to perform SOM modeling. After the SOM modeling, knowledge based system is used to label of the segments. The best way to construct a knowledge base is to make a rule set. Rules for the brain tissues, suspicious region and background are constructed using region properties and neighborhood function. Brain model is used to test the performance of segmentation. The brain model gives 97.46% accuracy and 11.36s working time.

3.5. SOM and Wavelet transform

A. Demirhan et al. [13] uses an anisotropic filtering in the preprocessing stage to improve the quality of the brain image without blurring the edges. Stationary Wavelet Transform (SWT) is applied to images to obtain the multi-resolution information about tissues. In this method no sub-sampling process is applied, so subimages obtained as a result of the transform is the same size as the original image. Then statistical features are extracted from the SWT subimages using spatial filtering process. The set of feature vectors formed by combining SWT coefficients and its statistical features are used to model SOM. After the training of SOM, LVQ1 and LVQ2 algorithms are used for tuning the weight vector of SOM. As a result, MR brain images are segmented into soft brain tissues and background regions.

Images obtained from the IBSR database are used for training and testing the SOM. Rough and fine tuning training of SOM require [0.5 0.05] epochs respectively. Performance measurement using tanimoto similarity metric gives an average value of 0.65 and 0.55 for GM and WM respectively. Instead Dice similarity index gives value of 0.7 and 0.78 for GM and WM respectively.

3.6. SOM-FCM and 3D Statistical Descriptors

In [14], A. Ortiz et al. proposed a segmentation technique based on 3D statistical features. In addition to 3D statistical features, local histogram features are extracted from the image. GA based selection stage is performed over the extracted features to form an optimized number of feature vectors. These feature vectors are modeled by SOM. SOM reduced the feature space to a number of prototypes, each of them representing the set of voxels. These prototypes are grouped together to define the cluster boarder in the SOM layer by using a FCM algorithm. Here the fuzzy clustering and unsupervised vector quantization does not use any a priori information. FCM addresses the problem of partial volume effect (PVE) (ie, Voxels can contain signal from several tissues at the same time) by the usage of FCM membership function. Jaccard Index used for the performance evaluation of segmentation gives mean and standard deviation of 0.83 ± 0.02 for WM and 0.82 ± 0.02 for GM.

3.7. GHSOM and Multi-objective Optimization

A. Ortiz et al. [15] improved the SOM performance by introducing Growing Hierarchical Self-Organizing Map (GHSOM) and multi-objective based feature selection technique to optimize the performance of segmentation. The main drawback of SOM is that size of the output map need to be selected before classification. GHSOM is a variant of SOM which grows dynamically and allow discovering inherent hierarchies on the data. GHSOM contains several SOM layers of variable size. During training process, the number of SOM maps and size of map is determined. The feature vectors selected from an image has greater influence in segmentation process because the odd features may cause misclassification. Selecting

discriminative features may improve the performance of classifications. To improve the results of GHSOM process, multi-objective optimization is used in feature selection stage. Once GHSOM is trained, classification is performed by using probability labeling method. Labels obtained from the IBSR database is used for calculating the tanimoto coefficient.

3.8. ASGHSOM

J. Zhang et al. [16] presented an Adaptive Growing Hierarchical SOM (ASGHSOM). It is an extension of SOM. In ASGHSOM multi-scale segmentation is fused with the competitive learning clustering algorithm to overcome the problem of overlapping gray-scale intensities on boundary regions. An adaptive spatial distance is integrated with ASGHSOM to reduce the noise effect and the classification ambiguity. ASGHSOM uses multiple SOM from low resolution level to high resolution level, but number of neurons in each layer is fixed. During training stage ASGHSOM layer uses the original SOM algorithm with adaptive spatial distance. Analysis of results of ASGHSOM and GHSOM shows that when the noise level increases in the image, ASGHSOM has better performance than GHSOM. Segmentation is performed on both simulated and real MR images. The simulated image is obtained from the BrainWeb simulated brain database and the real image is taken from IBSR database. Tanimoto performance metric gives mean and standard deviation of 0.69 ± 0.08 for GM and 0.66 ± 0.07 for WM.

Table 1 shows the different SOM based segmentation techniques and their main characteristics.

Table 1: Characteristics of SOM based segmentation methods

Method	**Features extracted**	**Feature selection**	**Main characteristics**
HFS-SOM	Image histogram features (4 features)	-	Efficient and fast
EGS-SOM	Statistical image descriptors (24 features)	GA	Robust scheme under noisy and bad intensity conditions
Wavelet transform and SOM	Feature vectors formed by combining SWT and its statistical features	-	Shows better segmentation result for GM and give average result for WM
SOM-FCM	3D statistical image descriptors, local histogram features (23 features)	GA	Solves the PVE, reduce noise effect and classification ambiguity
SOM and knowledge based expert Systems	Statistical image descriptors (21 features)	PCA	Accurate labeling of tissues
GHSOM	Statistical image descriptors (24 features)	Multi objective optimization	Avoids the drawbacks of the SOM, by growing map size dynamically
ASGHSOM	Features such as intensity, average gradient, mean value of voxels	-	Solve the partial volume effect, reduce noise effect and classification ambiguity

IV. CONCLUSION

In this survey different methods for the segmentation of MR brain images using SOM are analyzed. The survey shows that SOM gives better segmentation results. Normally SOM is a hard clustering algorithm over feature vectors selected. Even though it is good for medical image segmentation, SOM shows some drawbacks. Quality of SOM depends on the feature vectors used for training. Fixed map size is another factor that affects SOM, which can be overcome by using GHSOM or ASGHSOM.

REFERENCES

[1] A. K Jain, M. N. Murty, P. J Flynn., (1999), "Data Clustering – A Review, ACM Computing Survey", vol.31, no. 3, pp. 265 322.

[2] J. B. MacQueen., (1967), "Some Methods for Classification and Analysis of Multivariate Observations", Proceedings of 5-th Berkeley symposium on Mathematical Statistics and Probability, vol. 1, pp. 281-297.

[3] J. C. Bezdek, (1981), "Pattern Recognition with Fuzzy Objective Function Algorithms", Plenum Press, New York.

[4] T. Kohonen, (2001), "Self-Organizing Maps", Springer.

[5] M. Attik, L. Bougrain, F. Alexandre, (2005), "Self-Organizing Map Initialization", Springer.

[6] H. E Rickard, Tourassi, G. D & Elmaghraby, (2004), "Breast segmentation in screening mammogram using multiscale analysis and self-organizing maps", Proceedings of the 26th Annual International Conference of the IEEE-EMBS, San Francisco, CA.

[7] P. L Chang and W.G Teng, (2007), "Exploiting the self-organizing map for medical image segmentation", 20th IEEE international Symposium on Computer-Based Medical Systems (CBMS'07), Maribor.

[8] E. Arsuaga Uriarte, F. Diaz Martin, (2005), "Topology preservation in SOM", International Journal of Applied Mathematics and Computer Sciences 1;1.

[9] Chang, H.-H., Zhuang, A. H., Valentino,D.J.,Chu,W.-C., (2009), "Performance measure characterization for evaluating neuro image segmentation algorithms. Neuro-Image 47(1), 122–135.

[10] Y. Li and Z. chi, (2005), "MR Brain Image Segmentation Based on Self-Organizing Map Network", International Journal of Information Technology Vol.11, No.8.

[11] A. Ortiz, J. M. Górriz, J. Ramírezb, J. M. Llamas-Elvira, D. Salas González, (2013a), "Two fully-unsupervised methods for MR brain image segmentation using SOM-based strategies", Applied Soft Computing, 2668–2682.

[12] I. Guler, A. Demirhan, R. Karakis, (2009), "Interpretation of MR images using self-organizing maps and knowledge based expert systems", Digital signal processing 19 668-677.

[13] A. Demirhan, I. Guler, (2011), "Combining stationary wavelet transform and self organizing map for brain MR image segmentation", Engineering Applications of Artificial Intelligence 24 , 358.

[14] A. Ortiz, A. A. Palacio, J. M. Gorriz, J. Ramorez and D. Salas- González, (2013b), "Segmentation of Brain MRI Using SOM-FCM based method and 3D statistical Descriptors", Computational and Mathematical Methods in Medicine, Volume 2013, Article ID 638563.

[15] A. Ortiz, J.M. Górriz, J. Ramírezb, D. Salas-González, (2013c), "Improving MRI segmentation with probabilistic GHSOM and multiobjective optimization", Neurocomputing 114,118-131.

[16] J. Zhang, D. Dai, (2009), "An adaptive spatial method for automatic brain MR image segmentation", Progress in Natural Science 19, 1373-1382.

BIOGRAPHIES

Jesna M received her B.Tech in Computer Science and Engineering from Vimal Jyothi Engineering College, affiliated to the Kannur University, Kerala and currently doing M.Tech in Karunya University, Coimbatore.

Dr. Kumudha Raimond received her B.E from Arulmigu Meenakshi Amman College of Engineering, affiliated to Madras University and M.E from Government College of Technology, Coimbatore and Doctoral degree from Indian Institute of Technology, Madras, India. Her area of expertise is in intelligent systems. She is a Senior Member of International Association of Computer Science and Information Technology (IACSIT) and Member of Machine Intelligence Research Lab: Scientific Network for Innovation and Research Excellence.

Implementation of a Lean Model for Carrying out Value Stream Mapping in a silk Reeling process Industry

[1,] Y. Sujatha, [2,] Dr. K.Prahlada Rao
[1, 2,] *Department of Mechanical Engineering*
J.N.T.U.A, Anantapur, Andhra Pradesh

ABSTRACT
Value Stream mapping technique involves flowcharting the steps, activities, material flows, communications, and other process elements that are involved with a process or transformation. In this respect, Value stream mapping helps an organization to identify the non-value-adding elements in a targeted process and brings a product or a group of products that use the same resources through the main flows, from raw material to the arms of customers. In this study, a practical study carried out in a silk manufacturing process industry. The main aim was to draw the current state value stream mapping for the main. Further, the paper has identified some of the processes which can be carried out by the sub contractor and suggested measures to be taken up by the higher level management in reducing the non value added process. It discusses the reduction in the set up time and cycle time that can be obtained through the implementation. This paper also discusses the plan of action for improving the Future State Value Stream Mapping (FVSM). A FVSM for the manufacture of Base is drawn.

***Keywords*:** Current state value stream mapping (CVSM), Future state value stream mapping (FVSM), Value added time.

I. INTRODUCTION

This research work was conducted at a medium scale garment industry in Andhra Pradesh in order to critically analyze the company's manufacturing process and subsequently to identify the waste streams. A future state map was developed with the objective of improving the efficiency. Although this assignment was confined to a small manufacturing company, the positive results of VSM could be applied effectively, with necessary adjustment, to a majority of the medium scale silk reeling manufacturing process industries across in Andhra Pradesh. It will yield results as organizations are seeking ways to increase the value of their products and services by eliminating waste.

The demand for raw silk in India can be grouped under four main heads: domestic demand for traditional non-graded multivoltine; domestic demand for non-traditional silk fabrics made up of non-graded bivoltine silk; international demand for silk fabrics and readymades which requires graded bivoltine; and niche markets for special handloom fabrics, requiring local reeled silk and processed silk waste. In recent years, due to a shortage in domestic supply, India has emerged as a net importer of raw silk and yarn.

India is the only country in the world to produce all varieties of silk, viz mulberry, tasar, eri and muga, although only mulberry silk is important from the point of view of trade. Based upon the technology used, silk is called bivoltine or multivoltine, which essentially refers to the frequency with which the silkworm hibernates. Bivoltine silk is a better quality silk, based upon the strength and length of the fiber. The type of silk produced in India is multivoltine, as climatic conditions in India are not conductive to produce the higher-quality bivoltine silk.

The present trends represent a limitation to price increases for silk produced in India by import from other silk producing countries like China, Brazil, Korea etc., as well as by substitution with other fibres including by artificial silk. It also appears unlikely that the present demands can be met merely by expanding mulberry area in order to increase cocoon and raw silk production. Future additional output in raw silk will therefore mostly have to come from substantial productivity increases, mainly area and labour productivity. Concurrently there is a growing demand for silk fabric among the growing Indian middle class and young urban consumers. The expanding power loom weaving industry typically produces these modern silk fabrics. The quality requirements imposed by this trend can only be met by bivoltine raw silk, although it is possible to produce high quality multi-bivoltine silk for conventional power loom.

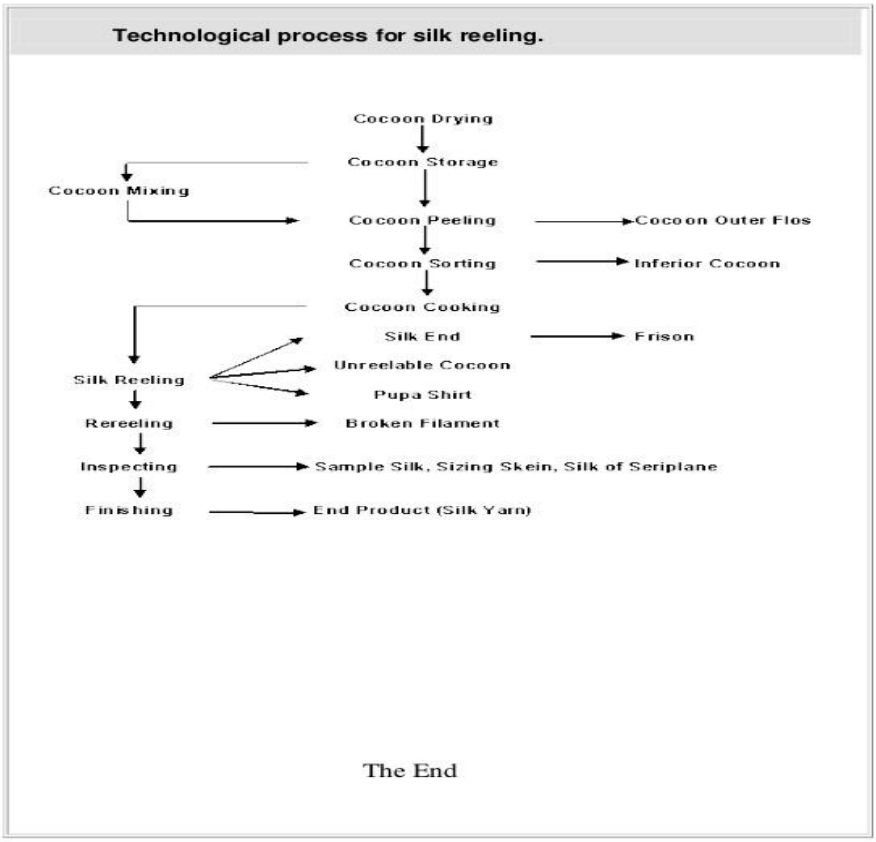
The process of drawing silk fiber from the cocoon is called "reeling" the cocoons are cooked in hot water and the silk fiber in unwound from the cocoons. The silk consists of two proteins, the inner core of fibroin and an outer cover of gum sericin. During reeling, the cocoons are processed in hot water at 95-97°c for 10-15 minutes. This process is called cooking.

II. SILK REELING TECHNOLOGY

The single filament from the cocoon cannot be used for any purpose as it is too fine (2 to 3 denier). Hence based on the denier of the silk yarn required to be produced for any particular end use, a known number of filaments are combined and unwound together to form a single compact raw silk yarn. The unwinding of the filaments from softened cocoons in a water media, combining the filaments and winding the same onto a spool or reel is called reeling.

Softened cocoons are brushed to detect the end of the filament after which they are transferred to the reeling basin for unwinding the filaments. New filaments are added or joined to the existing filaments in the group, as and when any filament breaks or the filament in the cocoon is unwound completely, so that continuous raw silk yarn of a required denier is obtained

The technological process of silk reeling.



III. VALUE STREAM MAPPING

This paper describes an application of value stream mapping(VSM). Consequently, the present and future states of value stream maps are constructed to improve their production process by identifying waste and its sources. A noticeable reduction in cycle time and increase in cycle efficiency is confirmed. The production flow was optimized thus minimizing several non-value added activities/times such as bottlenecking time, waiting time, material handling time, etc.

.

IV. LITERATURE REVIEW

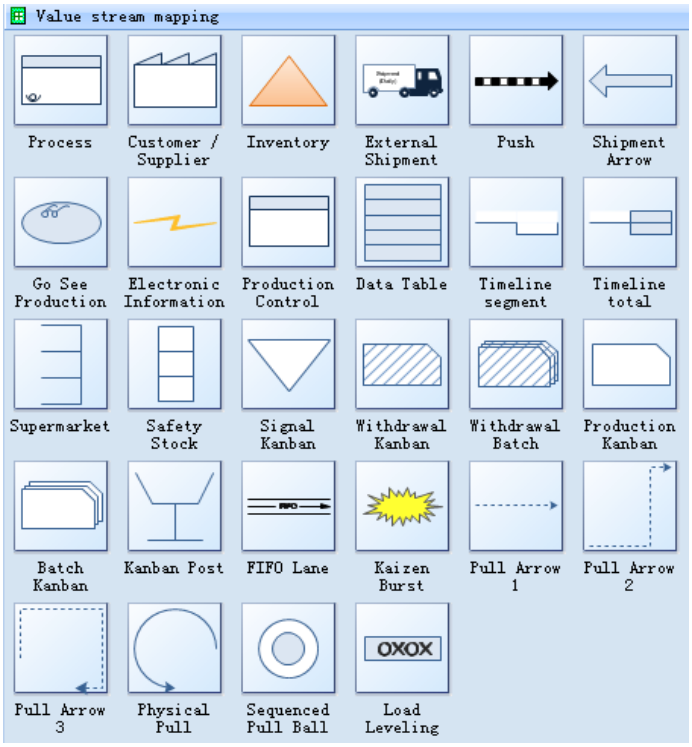
Currently, assembly lines are still fundamental to get the smoothing of production system (Miltenburg, 2001), and they are studied under several operative perspectives seeking its flexibility (El-Maraghy, 2005; Calvo et al. 2007). Both concepts are subjects of pull systems. In assembly lines, pull and lean systems are concepts frequently connected, although they pursue different objectives; pull system toward the reduction of work-in-process (WIP) and lean system toward minimizing the buffer variability (Hopp and Spearman, 2004). Moreover, with respect to the election of production control system in a pull system, the alternatives considered are focused on kanban (Monden, 1998) and constant work in process (CONWIP) (Spearman et al. 1990), both of them focused toward the reduction of WIP.

Although many tools exist, from its origin, VSM has demonstrated its efficacy (Womack and

Jones 1996; Sullivan et al. 2002; Abdulmalek and Rajgopal 2007; Serrano et al. 2008; Sahoo et al.

2008). Following the benchmarking perspective, as well the use of a contrasted tool, facilitates the interchange of improvements. It is a tool that provides communication solutions for practitioners to obtain maximum efficiency and definitions of theoretical development points to become a reference among redesign techniques (Serrano et al. 2008). A detailed description of VSM can be seen in Rother and Shook (1999). Thus, as improvement tool simplifies the measurement of times without added value, so the calculation of indexes of lean metrics is easier and it is possible to enhance the operative actions with strategic results.

This paper unifies several gaps and it shows how value stream transformation actions can achieve high levels of performance in a short time and in a real industry, inside a context of an assembly line with a small space and that it requires flexibility.



Source: lean tools and techniques book

Researchmethodology:-

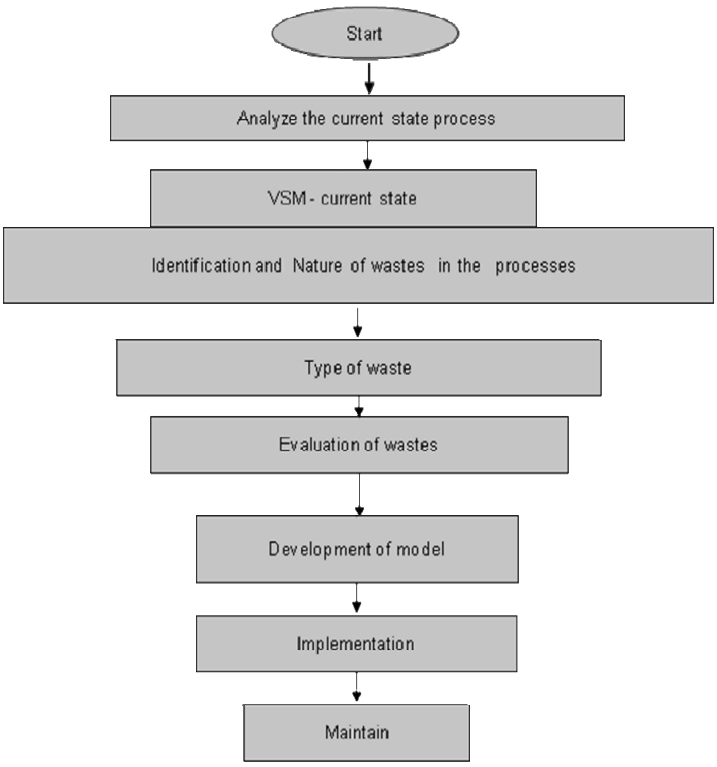


Figure 2 Methodology Flowchart

V. VALUE STREAM MAPPING

A manufacturing system operates with timing of step-by step activities. The various steps in implementation of VSM are shown in Figure 3 and are discussed

5.1. Preparation of Current State Map

Interaction with the industry information of the customer's requirement. The company has a wide

Table 2. VSM input data

Customer Order	1500(per month)
demand	30kg (per day)
Working Hours	One Shift 9 Hours (per day)
Break	One Hour (per day)
Raw Materials	One weak

Table 3. Process cycle time

Process	Cycle time (sec)
stifling	2700 sec
Drying of coons	1200 sec
Sorting	600 sec
Deflossing	900 sec
Cocoon riddling	1200 sec
Cocoon boiling	900 sec
Cocoon Brushing	600 sec
Reeling	28800 sec
Thread steaming	600 sec
Re-reeling	14400 sec
Finishing	600 sec
Packing	600 sec

5.2. TAKT Time: A Benchmark for Process Pace

Takt demonstrates the rate at which the customer buys the product. TAKT reflects the frequency at which the product has to come out of the manufacturer to meet the customer demand. From Figure 4 Takt time is calculated by dividing available working time per shift (in sec) with the customer demand per shift.

Available Time =Working hours – Breaks= (9 x 60x 60) – (1 x 60 x60) = 28800 sec

$$TAKT\ Time = \frac{Available\ working\ time\ per\ shift}{Customer\ demand\ per\ shift}$$

TAKT Time = 28800/30

= 960 sec

TAKT time = 960 seconds Demand=900 kg /month Demand per shift=30 kg / day

5.3. Process improvement (Removing Bottlenecks)

Improvements in quality, flexibility and speed are commonly required .The following lists some of the ways that processes can be improved.

- Rearranging the layout to eliminate large amounts of inventory between operations
  - Add additional resources to increase capacity of the bottleneck (an additional machine can be added in parallel to increase the capacity)
  - To improve the efficiency of the bottleneck activity
- Minimize non-value adding activities (decrease cost, reduce lead time)
  - Eliminating the batching and moving to one piece flow

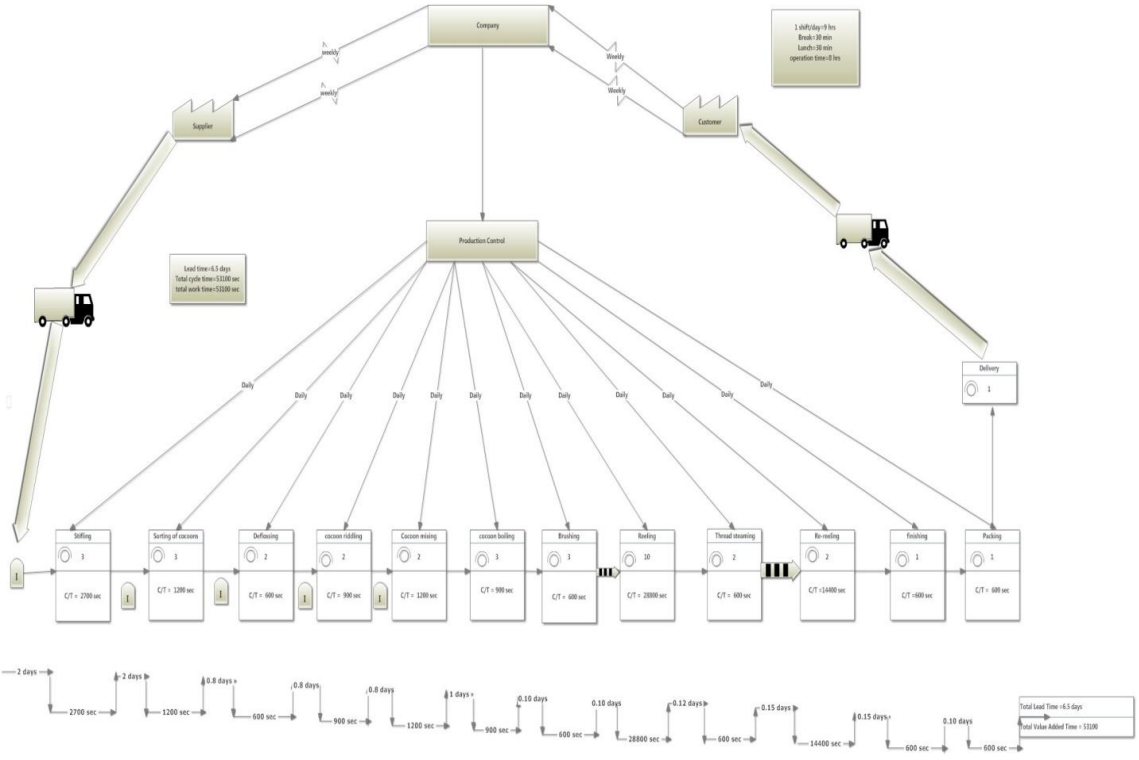


Fig:- **Current state value stream mapping**

Current layout

The current layout silk reeling manufacturing process . the silk reeling process as shown in the above figure. From the figure the flow of material are from one process to another process . the cocoons are converted one stage to another stage to cocoon stifling , sorting, storage, cocoon boiling in this process was observed that the wastage is more so hear lean manufacturing tool to improve the value added time and reduce the wastage . it was decided to carry out discussions with the mangers, engineers and workers and the issues relating to the increase in value added time were pointed out. Further, the the authors used the questionnaires and collected the data regarding the awareness, knowledge and implementation difficulties faced by the employees and the management in its effective implementation. Finally, based on the feedbacks collected, it was decided to suggest the following lacuna in the process of manufacture and suggested remedial measures for the same .Finally, a future state value stream map was proposed to be implemented.

Future state value stream mapping:-

It was observed that processed like Cocoon sorting, cocoon boiling, cocoon reeling can be eliminated waste can be eliminated reduced by improving the quality of silk .

To carry out online inspection and scrap reduction programs.

To implement Kaizen technique for the effective Boiling process

To review the work sequence in order to reduce idle time

To identify value added versus on value added elements and minimize/ eliminate non value added operations

Hence the following steps were suggested for the improvement of the process of manufacture below figure. Shows the future state vale stream mapping implementation.

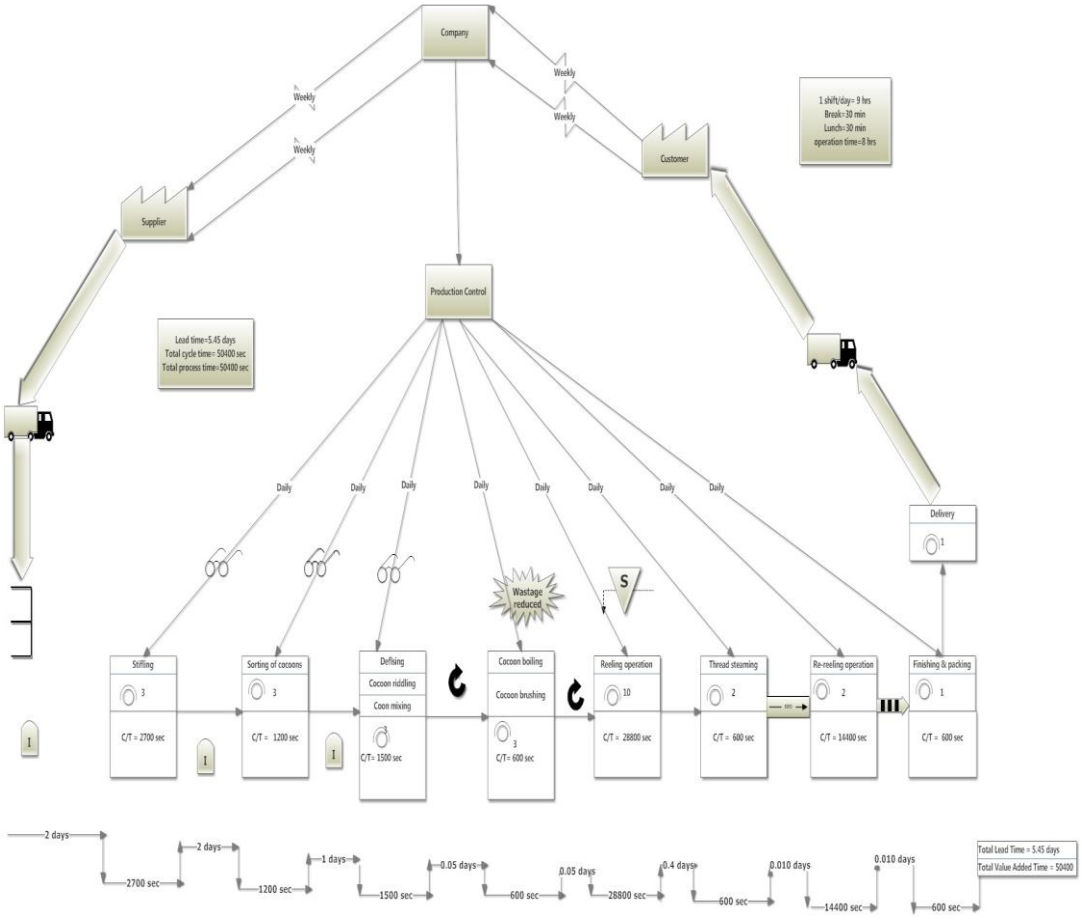


Fig:- Future state value stream mapping

REFERENCES

[1] Abbett D., Payne V. (1999), Gulfstream value stream tour; *presentation at 1999 Lean Summit.*

[2] Badrinarayana S., Vishnupriya Sharma. (2007), Value stream mapping as the systems way of optimizing the flow in an organization for producing of goods, Proc in a Challenge for Collaborative Manufacture systems; *APCOMS 2007*; Bali, 5th -6th Sept.

[3] Doolen T., Nagarajan R.D, Hacker M.E. (2002), Lean manufacturing: An electronics manufacturing perspective; *Proc. of the 2002 IERC*; Orlando, FL, May 19-22

[4] Hines P., Rich N. (1997), The seven value stream mapping tools; *International Journal of Operations & Production Management* 17(1); 46-64.

[5] Hyer N.L., Wemmerlov U. (2002), The office that lean built; *IIE Solutions* 34; 37-43.

[6] Jones D. T. (2006), From lean production to lean consumption- Chairman; Lean Enterprise Academy, UK, *www.leanuk.org.*

[7] Jones D.T., Hines P., Rich N. (1997), Lean logistics; *International Journal of Physical distribution & logistics Management* 27(3/4); 153-173.

[8] McDonald T., Van Aken E.M., Rentes A.F. (2002), Utilizing simulation to enhance value stream mapping: A Manufacturing case application; *International Journal Of Logistics: Research and Applications* 5(2); 213-232.

[9] Moore R. (2006), Selecting the right manufacturing improvement tools, ISBN: 0750679166; *Elsevier Science & Technology Books*.

[10] New C. (1993), The use of throughput efficiency as a key performance measure for the new manufacturing era; *The International Journal of Logistics Management* 4(2); 95-104.

[11] Ohno. T. (1988), The Toyota production system: Beyond large-scale production; Productivity Press; Edition I.

[12] Rother M., Shook J. (1999), Learning to see: Value stream mapping to add value and eliminate muda; 2 Edition, Brookline, MA; The Lean Enterprise Institute Inc.

[13] Shingo Shigeo (1989), A study of the Toyota production system from an industrial engineering viewpoint; Productivity Press; Portland, OR.

[14] Simchi-Levi D., Kaminsky P., Simchi-Levi E. (2004), Designing and managing the supply chain, concepts strategies and case studies; McGraw-Hill.

[15] Womack J.P., Jones D.T. (1998), Lean thinking: Banish waste and create wealth in your corporation; New York, Free Simon & Schuster.

[16] Womack J.P., Jones D.T. (2005), Lean solutions: How companies and customers can create value and wealth together; New York, Free Press.

[17] Womack J.P., Jones D.T., Roos D. (1990), The machine that changed the world: The story of lean production; New York, Simon & Schuster.

A Survey on Feature Extraction Techniques for Palmprint Identification

Sincy John[1], Kumudha Raimond[2]
[1] PG Student, Department of Computer Science and Engineering, Karunya University, Tamilnadu, India
[2] Professor, Department of Computer Science and Engineering, Karunya University, Tamilnadu, India

Abstract:
Biometric recognition system is a pattern recognition system to provide a reliable personal recognition schemes to either confirm or determine the identity of an individual based on specific physiological or behavioral characteristics possessed by the user. Based on these characteristics, biometrics is normally classified into two categories, physiological and behavioral. Physiological biometrics is based on measurements and data derived from direct measurement of a part of human body. Some of the physiological biometrics include finger print, palmprint, facial etc. Behavioral biometrics is based on the behavioral traits like speech patterns, signature etc. In the biometric family, palmprint based identification system has become one of the active research topics. In this, the identification process consists of image acquisition, preprocessing, feature extraction and identification. A comprehensive survey on different techniques that are used for palmprint identification is presented in this paper.

Keywords: *Biometrics, palmprint, Identification.*

I. INTRODUCTION

Biometric based recognition systems have been receiving much attention in the field of personal identification/verification over the past decade. Based on the traits used for identification, biometrics is broadly classified into two categories such as behavioral and physiological as shown in fig. 1. In biometric system, physiological characteristics are considered to be more reliable compared to the behavioral characteristics. Palmprint comes under the physiological category. Palmprint focuses on the inner surface of a hand, its pattern of lines and the shape of the surface. Palmprint contains more amounts of detail in terms of principal lines, wrinkles and creases

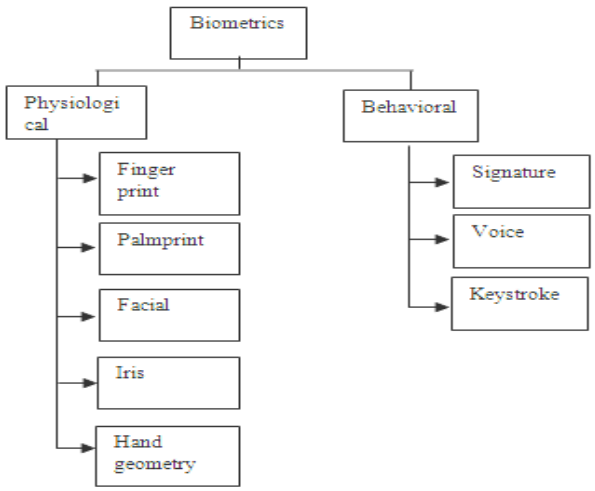


Fig.1: Biometric classifications

The inner surface of the palmprint mainly contains three flexion creases, secondary creases and ridges as shown in fig 2 [13]. The flexion creases are also called as principal lines and the secondary creases are called wrinkles. The flexion and the major secondary creases are formed between the 3rd and 5th months of pregnancy [1] and superficial lines are formed after birth. Basically, palmprint operates in three modes: enrollment, identification and verification.

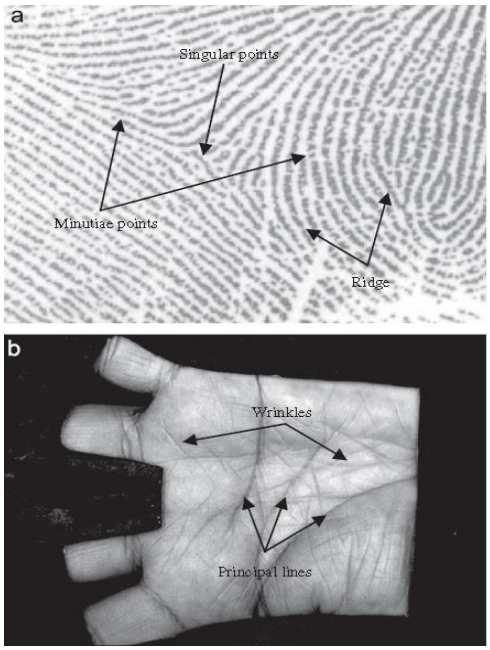


Fig.2: Palmprint features (a) a high resolution image and (b) a low resolution image

In enrollment process, several palmprint samples have to be given by the user to the system. Verification is the process of comparison with only those templates corresponding to the claimed identity. Identification is the process of comparing the palmprint against templates corresponding to all users in the database.

Palmprint identification as wide application, is used in both off-line applications as well as in on-line applications. In the case of off-line applications mainly high resolution images are used. Off-line applications include criminal detection. On-line applications like civil and commercial application use low resolution images.

A typical palmprint identification system as shown in fig 3 consists of four phases i.e., palmprint scanner, preprocessing, feature extraction, and identification [2]. Palmprint images are collected using palmprint scanner.

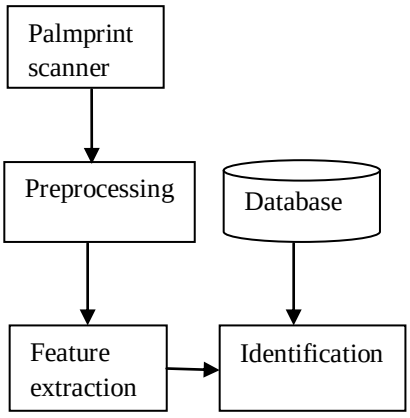


Fig.3: Typical palmprint identification system

II. PALMPRINT IDENTIFICATION TECHNIQUES

There are many techniques available for palmprint identification proposed by many researchers. This survey is based on various palmprint identification techniques.

2.1. Palmprint identification using 2-D Gabor filter

Among the various palmprint identification methods 2-D Gabor filter is used by Kong et al [3]. In this method texture information is obtained by using 2-D Gabor filter. In this, the Gabor function with certain parameters are used which is transformed into discrete Gabor filter. To provide robustness to brightness, Gabor filter is turned to zero DC. The adjusted Gabor filter is convoluted with sub images. Sample points in the filtered image are coded into two bits by using certain inequalities. By using this coding method, only the phase information about the palmprint image is stored in feature vector. In the matching process the two palmprint images are compared using the hamming distance. Here, each feature is considered as two 2-D feature matrices that is real and imaginary. A normalized hamming distance is used for palmprint matching. For perfect matching, hamming distance is zero. It provides robustness against varying brightness and contrast for images. However, they lack the ability of orientation selectivity and representation of major principal lines and wrinkles in the palmprint.

2.2. Using Fisherpalm

In [4], palmprint recognition method called fisherpalms is used. In this method, the points in the high dimensional image space are the palmprint images. In order to discriminate different palmprints efficiently, a linear projection based on FLD (Fisher's linear discriminant) is used to project palmprint from this high dimensional space to a lower dimensional feature space. The points in the high dimensional image space are called as original palmprint space (OPS). The two stages present in this method are Enrolment stage and Recognition stage. In the enrolment stage, the Fisherpalms linear transformation has to be computed by using the training samples and at first it is saved as Fisherpalm space and the mean of the palmprint classes is projected to Fisherpalm space. In the recognition stage, the feature vector is obtained by projecting the input palmprint image onto the stored Fisherpalm space. The feature vector is compared to that of the stored templates to obtain the recognition result.

2.3. Using Eigenpalm features

Another palmprint recognition method used in [5] is based on Eigen space technology. In this method, the original palmprint images are transformed into "eigenpalms" using Karhunen-Loeve (K-L) transform which is a small set of characteristic feature image. Eigen palms are the Eigen vectors of the training set. K-L transform normally represents the eigenvectors of the covariance matrix which contains the set of palmprint images. Eigenvectors is defined as the subspace of the palmprint, which are referred to as eigenpalms. Each training set contains different palmprints. In that, each palmprint is represented by an eigenvector. Because of that, the number of eigenpalms is equal to the number of different samples in the training set. According to the theory of Principal Component Analysis (PCA), it is not necessary to select eigenvectors as base vectors. Only the eigenvectors corresponding to the largest Eigen values can be used to represent the characteristics of the set. Features are extracted in the form of Eigen values and then Euclidean distance classifier is used for palmprint recognition.

2.4. Using Binary orientation co-occurrence vector

Normally for palmprint verification various approaches are being used. Among them the most commonly used approach is orientation based coding methods. In the orientation based coding approach, different types of codes are there like competitive code (comp-Code) [6] and robust line orientation code (RLOC) [7]. In this the images are convoluted with filters of different orientations and dominant orientations are determined based on some criterion. High accuracy palmprint identification could be implemented by simply coding the orientation map of palmprint. By doing this some valuable information will be lost as only one dominant orientation is used to represent a local region. In [8], multiple orientations are used to represent the local region. This multiple orientation is obtained by preserving all orientation information. This preservation is done by concatenating the responses as a vector. Then thresholding is done in order to binarize the response vector. Hamming distance is used for identification purpose.

2.5. Using Gabor feature based $(2D)^2$ PCA

According to the earlier works, Gabor filter convoluted with palmprint images is used for extracting the features. The features are represented using hamming code and identification is carried out using hamming distance approach. It has several advantages. But it needs more time and memory for feature coding and matching pixels. In order to extract more local features, a series of Gabor filters of various scales and orientations (Gabor filter bank) are used. But it is difficult to implement. By combining the above two procedures a new algorithm was put forward in [9]. In this process, Gabor filter bank is used in the first step for extracting the Gabor features by convolution with the original image. Gabor feature space will contain all the Gabor feature metrics of the training samples. In the second step, the dimension of Gabor feature space is reduced in both row and column direction $(2D)^2$ PCA is used. This in turn will result in fewer coefficients for feature matching. In the last step to perform feature matching and classification, Euclidean distance and nearest neighbor classifier respectively are used.

2.6. Using Gabor-based local invariant features

Another feature extraction process is proposed by X.Pan et. al., in [10]. Typical palmprint recognition system consists of three stages that is preprocessing, feature extraction and identification. In feature extraction stage, features are extracted. For extracting the features, three steps are mainly used. In the first step, a 2D Gabor filter is used. Gabor filter is used for extracting local invariant features by convolution with the palmprint image. In the next step, the obtained feature is given to the two layer partition. In the first partition, each palmprint image is divided into upper-layer blocks. Later in the second partition each of the upper-layer block is divided into four and constitute the lower layer partition. In the last stage, the local relative variance of the partitions are calculated. In order to get the local invariant feature first it is partitioned and then the difference of variances between these partitions that is lower-layer and upper layer is calculated. For matching purpose, nearest neighbor classifier is used.

2.7. Using 2-D Gabor wavelet

In [11], palmprint image is taken as input. The palmprint image is normalized based on its orientation, position and illumination. The feature extraction step is carried out in two phases. In the first phase, a 2D Gabor wavelet is used for decomposing the image. The image is decomposed by using the Gabor filters, that is by convoluting the image with the Gabor function. And the decomposed image is given to the next phase of the feature extraction step. In this phase a Pulse Coupled Neural Network (PCNN) is used. PCNN converts each of the decomposed sub band into a series of binary images. From these binary images, entropy value is calculated and regarded as the feature. These features are given to support vector machine for palmprint classification purpose.

2.8. Using adaptive lifting wavelet scheme

The earlier work done on the palmprint recognition takes a lot of time as well as it is difficult to implement with hardware. So, in order to avoid this problem in feature extraction phase, wavelet based method is used. In this method [12] mainly three steps are used. To extract the features, adaptive lifting scheme and PCNN are used and support vector machine is used for the identification purpose. In the first step, adaptive lifting wavelet scheme is used. The lifting scheme provides a simple yet flexible method for building new, possibly nonlinear, wavelets from existing ones. It comprises of a given wavelet transform, followed by an update and a prediction step. Each of the image is decomposed into approximate image and detail image using a wavelet transform. The output comprises of three detail sub bands and one approximate sub band. The detailed sub band is given to the PCNN. In this each of the sub band is converted into a series of binary images. From these binary images entropy values are calculated and these are considered as features. These features are given to the next step, i.e., to the classifier. Support vector machine is used to analyze data and recognize patterns.

III. CONCLUSIONS

This survey shows the various techniques that are used for palmprint identification. In some of the techniques the major demerit found is the orientation selectivity problem, complex encoding process and difficult to implement with hardware. Some techniques are efficient and consume less time for identification process. Each technique has its own advantage and disadvantage based on cost, classification time and robustness to varying factors. The techniques can be selected based on the requirement.

REFERANCES

[1]. Kong, K.H. Cheung, D. Zhang, M. Kamel and J. You, "An analysis of Biohashing and its variants", Pattern Recognition, 39(7) (2006) 1359-1368.

[2]. Zhang. D and Shu. W., "Two novel characteristics in palmprint verification": datum point invariance and line feature matching", Pattern Recognition 32 (4) (1999) 691–702.

[3]. W.K. Kong, D. Zhang, W. Li, "Palmprint feature extraction using 2D Gabor filters", Pattern Recognition 36 (2003) 2339–2347.

[4]. X.Q. Wu, D. Zhang, K. Wang, "Fisherpalms based palmprint recognition", Pattern Recognition Letters 24 (15) (2003) 2829–2838.

[5]. G. Lu, D. Zhang, K. Wang, "Palmprint recognition using eigenpalms features", Pattern Recognition Letters 24 (2003) 1463–1467.

[6]. Kong, A., Zhang, D., "Competitive coding scheme for palmprint verification". In:Internat. Conf. on Pattern Recognition, (2004) 520–523.

[7]. Jia, W., Huang, D.-S., Zhang, D., "Palmprint verification based on robust line orientation code". Pattern Recognition 41, (2008) 1521–1530.

[8]. Z. Guo, D. Zhang, L. Zhang, W. Zuo, "Palmprint verification using binary orientation co-occurrence vector", Pattern Recognition Letters 30 (2009) 1219–1227.

[9]. X. Pan, Q.Q. Ruan, "Palmprint recognition using Gabor feature-based $(2D)^2PCA$", Neurocomputing 71 (2008) 3032–3036.

[10]. X. Pan, Q.Q. Ruan, "Palmprint recognition using Gabor-based local invariant features", Neurocomputing 72 (7–9) (2009) 2040–2045.

[11]. X. Wang, L. Lei, M.Z. Wang, "Palmprint verification based on 2D-Gabor wavelet and pulse-coupled neural network", Knowledge-Based Systems 27 (2012) 451–455.

[12]. X. Wang, L. Junhua, W. Mingzhe, "On-line fast palmprint identification based on Adaptive lifting wavelet scheme", Knowledge-Based Systems 42 (2013) 68-73.

[13]. K.Adams, Z. David, K. Mohamed, "A survey of palmprint recognition", Pattern Recognition 42 (2009) 1408-1418.

BIOGRAPHIES

Sincy John received her B.tech from co-operative college of Engineering Vadakara, affiliated to cochin university in the year 2012. She is currently doing M.tech in Karunya University.

Dr. Kumudha Raimond received her B.E from Arulmigu Meenakshi Amman College of Engineering, affiliated to Madras University and M.E from Government College of Technology, Coimbatore and Doctoral degree from Indian Institute of Technology, Madras, India. Her area of expertise is in intelligent systems. She is a Senior Member of International Association of Computer Science and Information Technology (IACSIT) and Member of Machine Intelligence Research Lab: Scientific Network for Innovation and Research Excellence.

A Comparative study of Hierarchal Protocols for Wireless Sensor Networks (WSN)

[1]Prakriti Trivedi, [2]Varun Mayanger, [3]Anand Kirori
[1] *Asst. Prof., Computer Department, Govt Engineering College, Ajmer*
[2]*M Tech (I.T.), Govt Engineering College, Ajmer*
[3]*M Tech (E.S.), Jaipur National University, Jaipur*

Abstract
Wireless Sensor Networks (WSN) are networks of highly distributed nodes which are deployed in very large number to detect an event or to measure certain physical parameters such as temperature, humidity, mobility, etc… with each node having its own battery. The main challenge in WSN mechanism is routing of packets in an energy efficient manner and hence to ensure this, several energy efficient routing schemes have been proposed in past. In this paper, author will discuss some of the cluster based routing schemes for WSN. Initially, author will begin by introducing WSN and their cluster based routing techniques in brief and then concluded with the comparison of those techniques on the basis of network lifetime, energy efficiency and various other parameters.

Keywords: Wireless Sensor Networks (WSNs), Cluster Head Selection in WSNs, Cluster-based routing protocols, Hierarchical clustering, WSNs routing protocols.

I. INTRODUCTION

WSN's are similar to mobile ad-hoc networks (MANETs) and it consists of large number of small nodes which are connected to each other through a wireless medium. These nodes are highly distributed and can communicate with their next hop neighbor to route the packet from source to sink. Every node possesses three components: (a) the sensor component used to sense the environment, (b) the processing component which performs computation on the data and (c) communication component which receives and transmits data to its neighbors.

The power required (P) by a node to transmit or receive packets is proportional to the data size (s) and the distance the packet needs to travel (d) [1].

$P = \theta * s * d$, θ – Constant -------- (1)

A node it a network transmits packets to the nodes in the network and receives packets to other nodes in the network. Therefore, the total amount of energy (E) that a node consumes in both transmitting and receiving packets can be expressed as [1]:

E = Σ (Power required to transmit data, Power required to receive data) -------- (2), or

E = P1+P2 -------- (3)
E= (θ*s1*d1) + (θ*s2*d2) -------- (4)

The task of computation of the data and the communication between nodes with their next hop neighbors involves certain amount of power consumption. The sensor nodes are highly distributed in a certain geographical region and hence it becomes very difficult to monitor and maintain each node manually. The battery power and its consumption determines the network lifetime. Moreover, the inability of the nodes to recharge themselves makes the need of topology control and routing techniques as the vital factors in determining the network lifetime. Routing packets in an energy efficient manner results in increasing the lifetime of sensor networks but the selection of routing protocol more or less depends on the network topology. In flat topology the nodes in the network transmits the data to the sink in hops, where the contention among nodes is checked through power control or node scheduling but has scalability issues [2].

On the other side, hierarchal architectures are scalable and suitable for a highly dense sensor networks. A form of hierarchal topology control is to group the nodes in clusters. In any given graph G = (V,E); clustering is simply the identification of a set of subsets of nodes Vi , i = 1, . . . , n in such a manner that $\cup i=1,...,n Vi = V$ [3]. As shown in Fig 1, each cluster consists of a Cluster Head (CH); the responsibility of which is the controlling of the interactions or communications among the cluster members. Members of each cluster communicates with their respective cluster heads and all the data is collected, aggregated and fused by the cluster head thus reducing the power consumption. If required; the cluster heads may form another layer among themselves.

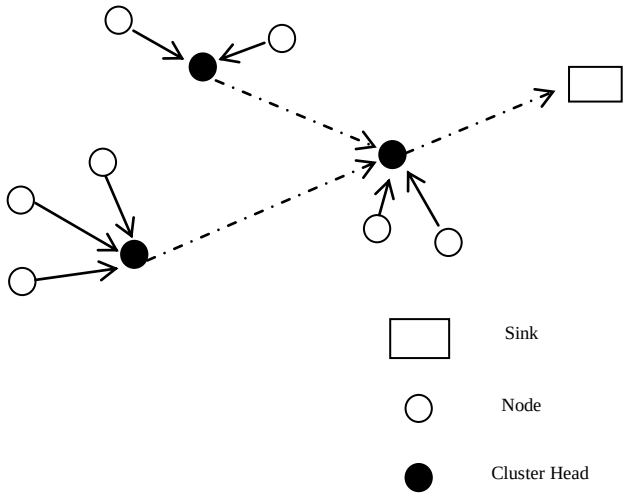


Fig. 1: A cluster based topology for WSNs

Clustering plays an important role in performance of the Wireless Sensor Networks and there are certain key attributes that should be taken into account before its implementations [4]:

- Cost of Clustering
- Selection of Cluster Heads and Clusters
- Real-Time Operation
- Synchronization
- Data Aggregation
- Repair Mechanisms
- Quality of Service (QoS)

II. HIERARCHAL ROUTING PROTOCOLS FOR WSN

1. LEACH

Low Energy Adaptive Clustering Hierarchy (LEACH) [5] is a clustering protocol which randomly distributes the energy load in the network. This even distribution of energy load is achieved by randomly rotating the cluster heads. After the formation of cluster head in the clusters, cluster head aggregates the data collected from the other cluster members and then directly communicate with the sink to relay the aggregated data. In LEACH the operations are carried out in rounds which comprise of two phases:

1) *Setup Phase* – cluster heads are selected which is followed by formation of clusters.
2) *Steady Phase* – cluster members and cluster heads communicate with each other by transmitting the data.

After each round, new cluster heads are selected on a random basis so that the energy consumption is evenly distributed across the network. Each node can individually decide whether it wants to become a cluster head. This decision making process is a function of the percentage of optimal cluster heads, frequency by which the node became cluster head and the last time when the node has been a cluster head. This threshold function can be defined as:

$$T(n) = \begin{cases} \dfrac{P}{1 - P\,[r \bmod (1/P)]} & \text{if } n \in G \\ 0 & \text{otherwise} \end{cases}$$

Where:

T(n) - Threshold function
n - A given node,
P - A priori probability of a getting elected as a cluster head,
r - Current round number and
G - Set of nodes that have not been elected as cluster heads in the last 1/P rounds.

During the cluster head selection processes each node generates a random number between 0 and 1. If this generated number is less than threshold function T(n), then that node becomes a cluster head for that cluster.

2. TEEN

Threshold sensitive Energy Efficient sensor Network protocol (TEEN), is a data-centric protocol suitable for time-critical applications [4]. Unlike LEACH, it is a reactive protocol which responds to the changes in the environmental parameters such as the temperature. In this scheme, initially clusters are formed and then the cluster heads broadcast two threshold messages to the nodes of their cluster [6]:

1) *Hard Threshold* – is the absolute value for the attribute to be sensed. If the sensed value is above the hard threshold then the node which sensed the value should switch on the transmitter and report it to the cluster head.

2) *Soft Threshold* – If any small change in the sensed value occurs, node itself triggers and switch on its transmitter and start transmitting the data.

In TEEN the node transmits data only when either the sensed value exceeds the hard threshold value or the change in the sensed value is greater than the soft threshold value.

3. APTEEN

Adaptive Threshold sensitive Energy Efficient sensor Network protocol (APTEEN) is an extension of TEEN and was developed to overcome the shortfalls of TEEN. With APTEEN WSNs can be reactive to time critical events and can also perform periodic data collection [7]. Here after the selection of cluster heads are made, each cluster heads broadcast four parameters:

1) *Attributes (A)* – These are the physical parameters like temperature, pressure, etc…which are to be collected.
2) *Thresholds* – These are of two types:
   (a) Hard Threshold
   (b) Soft Threshold
3) *Schedule* – It is a Time Division Multiple Access (TDMA) schedule and is used for assigning a slot to each node.
4) *Count Time* (T_c) - The maximum time period between two successive reports sent by a node and at times it is the multiple of the length of TDMA schedule.

4. PEGASIS

PEGASIS (Power-Efficient Gathering in Sensor Information Systems), aims at providing improvements to LEACH protocols. In PEGASIS, chains of nodes are constructed using the greedy algorithm instead of clusters to minimize the overheads [8]. In PEGASIS, it is assumed that each node has the global knowledge of the network and the chain construction begins from the nodes that are farthest from the sink. Each node in the chain only maintains the record of its nearest hop neighbors i.e. the previous and next neighbors. The communication in this chain occurs sequentially and each node aggregates the data received from its neighbor till the entire data is aggregate at a single node, which is the chain leader, which in turn controls the communication process by passing a token to the member nodes of the chain.

PEGASIS energy is conserved because:

- The maximum number of data messages that the head node receives is only two.
- The data is transmitted to the single hop neighbor who is nearest to the node.

III. COMPARISON OF DIFFERENT HIERARCHAL ROUTING PROTOCOLS FOR WSNs

Now we compare the hierarchal routing protocols discussed above on different parameters. Table 1 shows the comparison of the four protocols LEACH, TEEN APTEEN and PEGASIS. When it comes to energy efficiency PEGASIS is the most and LEACH is energy efficient protocol. PEGASIS provides performance enhancement of 100–300% over LEACH in energy consumption [8]. TEEN is slightly more energy efficient than LEACH and APTEEN performs lies somewhere between TEEN and PEGASIS. TEEN and APTEEN performs better than LEACH in terms of energy efficiency because of the fact that they transmits data on the basis of threshold value whereas LEACH transmits data continuously. All these four protocols have similar feature and architecture and have a fixed structure [9]. While LEACH, TEEN and APTEEN are cluster based algorithm PEGASIS is a chain based routing algorithm and avoids cluster formation. LEACH, TEEN and APTEEN selects the cluster heads randomly after each round of transmission while in PEGASIS a new chain leader is elected after each round of transmission.

Protocols	Energy Efficiency	Scalability to Heterogeneous Network	Cluster Head Selection	Network Lifetime
LEACH	Average	Low	Random	Average
TEEN	Good	Medium	Random	Good
APTEEN	Good	High	Random	Good
PEGASIS	Excellent	High	Absent	Good

Table 1: Comparison of Hierarchal Protocols for WSNs

IV. CONCLUSION

In this paper, we have discussed the four common hierarchal routing protocols LEACH, TEEN, APTEEN and PEGASIS. Although these protocols have been widely used for WSNs where each of them is having their own disadvantages. In WSN, since the energy of node is limited, it plays an important role in designing the routing protocol.

LEACH involves continuous transmission of data and thus it is not very energy efficient. Moreover, LEACH is only suitable for Homogenous networks. In heterogeneous networks, each node has a different residual energy. TEEN although is more energy efficient than LEACH, however, it is not suitable for sensor networks where periodic sensor readings should be delivered to the Sink, as it may be the case that the values of the attributes never crosses the threshold limit at all. As in TEEN, there are some unused or wasted time-slots, therefore sometimes sink may or may not be able to distinguish between dead and alive nodes [3]. Moreover, if cluster heads are not in each other's transmission radius, the messages will be lost. Although APTEEN offers flexibility of allowing the user to set the time interval, its main drawback is that it is complex to implement. Even though PEGASIS reduces the number of transmission in cluster heads, however, it involves excessive data flow which may lead to congestion in wireless sensor network. Its operation also involves significant delays as the data is transmitted sequentially in the chain and the chain leader has to wait till it receives all the messages before communicating with the sink. In PEGASIS all the information is aggregated into a single unit, which may result in delivering accurate information to the sink.

All the four protocols discussed in the paper do not consider neither the residual energy of the node and nor the location of the base station. As a result of which, sometimes a node with insufficient battery power can be selected as the cluster head which may result in the transmission failure. Therefore, there is a need to design a protocol which selects the cluster heads on the basis of both the residual energy and its location from the base and which also eliminate all the overheads related to the cluster head selection. There are various proposed algorithms that address this issue but their results are often having adverse effect on energy efficiency and lifetime of a network. In addition to these, further improvements in reliability needs to be examined in terms of possible modifications in the clusters which can result into re-clustering, which involves cluster head selection.

REFERENCES

[1] Ayan Kumar Das , Rituparna Chaki : A Novel Power-Balanced Routing Scheme for WSN. Recent Trends in Wireless and Mobile Networks. Recent Trends in Wireless and Mobile Networks. Third International Conferences WiMo 2011 and CoNeCo 2011 Ankara, Turkey, June 26-28, 2011.Proceedings. pp. 39- 48.

[2] Ian F. Akyildiz, Mehmet Can Vuran: Wireless Sensor Networks. Chapter 13, pp.308. ISBN 978-0-470-03601-3 (H/B).

[3] Holger Karl, Andreas Willig: Protocols and Architectures for Wireless Sensor Networks. Chapter 10, pp.288. ISBN: 0-470-09510-5

[4] Ankita Joshi , Lakshmi Priya.M, A Survey of Hierarchical Routing Protocols in Wireless Sensor Network. MES Journal of Technology and Management. May 17, 2011, pp. 67-71.

[5] Heinzelman, W.R., Chandrakasan, A., Balakrishnan, H.: Energy Efficient Communication Protocol for Wireless Microsensor Networks. In: Proceedings of the 33rd Hawaii International Conference on System Sciences (2000).

[6] Arati Manjeshwar, Dharma P. Agrawal: TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks. In: Proceedings of 15th *IEEE* Parallel and Distributed Processing Symposium.

[7] Arati Manjeshwar, Dharma P. Agrawal.: APTEEN: A Hybrid Protocol for Efficient Routing and Comprehensive Information Retrieval in Wireless Sensor Networks In: Proceedings of IEEE International Parallel and Distributed Processing Symposium 2002.

[8] Ian F. Akyildiz, Mehmet Can Vuran: Wireless Sensor Networks. chapter 7, pp.150. ISBN 978-0-470-03601-3 (H/B).

[9] Debnath Bhattacharyya, Tai-hoon Kim and Subhajit Pal: A Comparative Study of Wireless Sensor Networks and Their Routing Protocols. In:MDPI Algoritms journal December 2010,vol 10 pp.29-42. ISSN 1424-8220.

Design & Development of Service Oriented Architecture Interface for Mobile Device Testing

[1,] Kanchan Mahajan, [2,] S.P. Karmore
M.E (ESC) – 4th Semester
Department of Computer Science & Engineering, G. H. Raisoni College of Engineering, Nagpur, India.
Department of Computer Science & Engineering, G. H. Raisoni College of Engineering, Nagpur, India.

ABSTRACT:
Mobile devices becoming more complex and evolving new with a variety of best features and functionalities. Nowadays new different OS versions have been released. A bunch of latest devices will have hit the market and with that mobile application testing become much more complex and challenging for all of us. There is no doubt specific testing approaches need by those mobile device. Service-Oriented Architecture (SOA) promises important benefits to today's organizations. SOA's architectural style that supports loosely coupled services to enable flexibility in an interoperable, technology adaptive manner which is related to the quality and scalability of the architecture. This paper proposes the SOA interface design and development to test the mobile device.

Keywords: *SOA Interface; Mobile Device; testing; COM Technique; Fault Injection Technique; Fault Taxonomy.*

I. INTRODUCTION

Handheld devices are evolving and becoming increasingly complex with the continuous addition of features and functionalities. Mobile applications are nothing but the a natural extension to the current wired phone. The testing of the mobile application is difficult due to the daily improvements in application software of mobile phones.

To design a new interface we have to consider following valuable factors:

- First analyze the target device environment which get directly interact with the user.
- Design the new approach by using which we can reuse the different test cases in our testing environment .
- It must have an ability for data processing while communication with specific memory capacity.

Thus, a testing approach that is highly intrusive to the target system under test may affect the actual result of the testing. Finally, testing behaviors is highly interactive.

Service-oriented architectures (SOA) is loosely coupled with complex interdependencies. SOA is the architectural style that supports loosely coupled services to enable business flexibility in, technology adaptive manner. SOA consists of a compound set of modules of different services that support a dynamic and flexible re-configurable end-to-end communication and make easy to integrate with high security and scalability.

SOA is based on the COM technique having an ability to reuse the components which maintains the quality of the architecture. The main purpose of this paper is to use the advantages of SOA to solve the problems in mobile device testing field, also to bring forward a new way of technology and thinking for the implementation of testing with a more general framework.

SOA benefits in four basic categories:

- reducing integration expense
- increasing asset reuse
- increasing business agility
- reduction of business risk

SOA allow a run time composition and exchange of independently developed services. Thus, the SOA paradigm is predestined here for the easy development of software systems and distributed applications. Specifically in mobile settings possibility to provide functionalities to mobile devices with restricted resources. The factors in the area of wireless communication technologies as SOA and the common advances facilitate the realization of better mobile business applications.

We propose a new testing approach based on SOA in order to overcome the existing limitations, which are currently more pressing in mobile usage scenarios. To develop largely de-coupled system and a highly componentized that makes application lifecycle management easier to operate is the goal of every SOA architect. The purpose of this paper to build an test interface to solve the problems in mobile device test with the goal to define a more general methodology and to bring forward a new way of mobile device testing with taking advantages of SOA.

II. PROBLEM DEFINITION

Mobile development has a set of distinctive features and the specific challenges can be mentioned: support of many hardware and software platforms, interconnections with other applications, correct work with a variety of sensors, high requirements for users experiences and the quality of the user interface and the existence of web mobile and hybrid applications that incorporate all of these challenges to web development. All of these features comes under the complexity and specifics the need of mobile testing. Additionally, a support of two novel concepts—multidirectional testing and flexible integration of testing techniques—was stated as a main requirement to the platform.

Testing SOA could be viewed as a complex computing problem and the key is to divide it into smaller and more manageable components to build quality into these component modules. For system level and application level we have to build sophisticated, maintainable and reusable test case library.

III. OBJECTIVES

It is really hard to do the mobile device test due to its constantly update and improvements. With the improvements and constantly upgrades in mobile application software makes difficult to test the device. For going to start the test design, first we have to consider the most important issues of the test interface framework are generality, reusability and scalability in a specific area. First discussed the characters of mobile platforms, devices and the applications running on them. From the overall analysis for the mobile device application software, we propose the testing approach and design the testing interface. Then based on the COM technique with the goal to design SOA based Interface to test application software of mobile device as a type of embedded system we introduce the new thought of service-oriented architecture. During the design, we have to focus on the technical implementation of this interface definition and design. Finally this interface is built and used to test application software of mobile device. At last the test results show that this testing interface provide a good foundation for the mobile device test and improved the testing flexibility.

The objectives of Mobile application software Testing are as follows:

- Functionality
- Usability
- Security
- Performance
- Conformity

IV. LITERATURE REVIEW

In the year 2007, Sun-Myung Hwang, Hyeon-Cheol Chae proposed "Design & implementation of mobile GUI testing tool**".** In this paper, GUI test was defined using tool. Most important design part with those users easily operate the software functions of this particular embedded system is the GUI. Since it established as an important factor of software success which needs the GUI test. But this test takes much efforts and time.

In the year 2007, as Myung-Hee Lee,1, Cheol-Jung Yoo1, Ok-Bae Jang proposed "Embedded System Software Testing Based On SOA For Mobile Service" To classify and assess technical realizations of business processes embedded system service offers a systematic way. As rapidly increasing the number of embedded systems, for various applications there has been a growing demand with the use of Service Oriented Architecture (SOA). But embedded system has restricted range of utilizing services in computing environment. A mobile computer is envisioned to be equipped with more powerful capabilities, including, the capacity of data processing, and the storage of a small database, a narrow user input and small size of display. The need of a driving force for a variety of mobile applications is for accessing information from anywhere at any time This paper present testing of embedded system software to overcome mobile restriction based on SOA.

In the year 2009, as Zhi- fang LIU, Bin LIU, Xiao-peng GAO proposed "SOA Based Mobile Application Software Test Framework" in a specific area the framework for test having constantly updates and improves in mobile application software makes it difficult for these points. Some issues of the test are there, which are important are its, reusability, generality and scalability present in this paper .This paper first proposes the definition of mobile device application software, its classification, and summarizes the testing technology. Then we introduce service-oriented architecture into this area using COM technique with the goal of designing a mobile application software test framework. During the design, we focus on the technical implementation and interface definition. Finally a test platform is built based on the framework and used to test typical software of mobile phone. The test result shows that the test framework greatly improved the testing flexibility by provided a good foundation for expansion and implementation of application device test.

V. SYSTEM ARCHITECTURE

1. Mobile Device Test Design

It's natural that Mobile Application software testing is more complex than the desktop or web applications. Due to the mobile with different applications goes smarter than day by day so its need more powerful testing platform to do successful application software testing and give the correct result. The Environment, Testing levels, Scope and Techniques of the Testing are the important body parts of the Mobile Application Test Matrix.

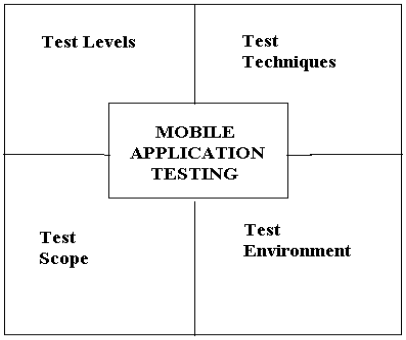


Fig.1. Mobile Application Test Matrix

Following are the different traditional software testing approaches:

- Record/Playback approach: Record the different events which are already played and stored to playback it again.
- Capture/Playback approach: In that user can easily notify that which test events are replayed.
- Particulars-Based Test approach: This is the document based approach which contains all necessary factors.
- Beta Test approach: This the most popular testing approach use by the common user at beta version.
  From the analysis we have to design one mobile testing platform with the following characteristics:
- Design different modules of this framework according to the mobile device features.
- To increase the flexibility of this architecture design one common communication interface between different modules using components.
- Construct different functional modules for the verification during testing.

2. System Architecture

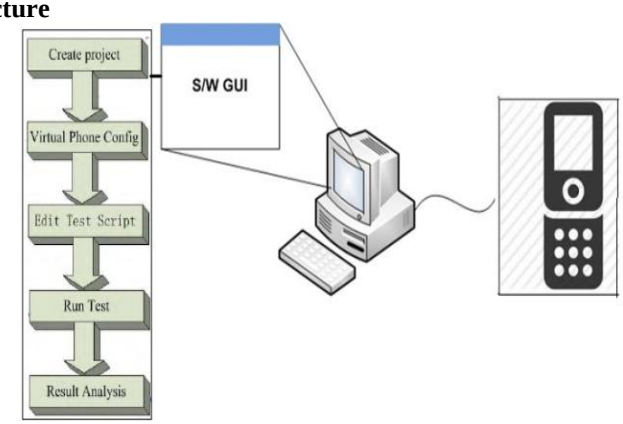


Fig. 2. System Architecture

In the system architecture mobile connects to the personal computer that contains the SOA based interface which is a Graphical User Interface. That SOA based testing GUI is the distributed architecture consisting different modules e.g. connectivity, testing, report etc. which are internally connects to one another. These modules are based on COM (Component Object Model). This GUI testing module contains different test cases to test mobile device or to monitor the mobile device. Run the test cases and the report module will show the result of test.

VI. METHODOLOGY

SOA Based Interface Design

Here in this paper, we are going to used combination of two Test approaches as Capture/Playback and Particulars-Based and at the same time script-driven test method. Then based on the test methods first we have to design different test cases and write this in one particular programming language and at last run the test cases to get the result in one report format.

A. Basic Components of SOA

Following are the three components of SOA:

- Service provider
- Service consumer
- Service registry

Each component can also act as one of the two other components. If a service provider needs additional information that it can only access from another service and acts as a service consumer.

- The service provider creates a service and within some test cases publishes its interface to access information to a service registry.
- The service registry is responsible to access information available to service consumers making the use of service interface.
- The service consumer to invoke the defined service in the database.

it binds to the service provider and service registry locates different entries

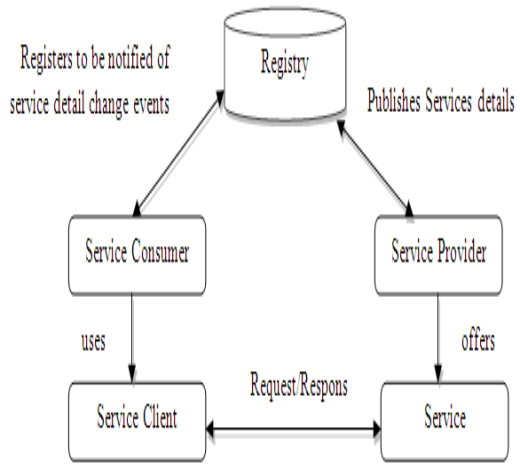


Fig.3. SOA Components

B. Division and design of Components Based On COM

COM is nothing but Component Object Module which is basically used for code sharing purpose. SOA is a composition of different modules connected to each other of distributed architecture which can easily communicate with each others. We have to build different independent components for different services using COM technique for the communication interface between those modules. This makes the component location in the test platform transparent as the self registration feature make easy communication between modules or the components. This Component- based architecture can easily upgrade and improve flexibility. It is always able to import new module to improve itself.

C. Interface Design

To design the SOA interface we have to analyze different interface parameters. Then make different components based on that parameter. These components are work under the module. One module can communicate with the other through this interface which is based on the components. Suppose one register module is their which communicate with the service module by using this interface to register the different query by different users. Interface passes the component values to other module to communicate and give result.

D. Implementation of the SOA Interface

SOA is a composition of different modules connected to each other of distributed architecture which can easily communicate with each others. This architecture is based on the component object module to reuse the data and it increases the scalability and flexibility .Implementations of the SOA interface to test the mobile device first have to analyze all the factors which affect on this testing. Need to design different application software test modules of for service components, test cases, data management which supports one another during test flow. Implementation of the mobile application software testing framework needs to build SOA modules of management and organization, and design basic service components, which supports the test flow. It mainly includes the project management related components line project manager, script editor, database manager and designs one common communication interface between different modules.

Fig.4. SOA Interface

E. A Fault Taxonomy for Service-Oriented Architecture

SOA is a very popular architecture design style. SOA having different steps which are as following:

1. Publishing
2. Discovery
3. Composition
4. Binding
5. Execution

Here we are using fault injection technique. Fault injection is a method to test system for fault reliability and tolerance.

1) We identify possible or expected faults following our taxonomy.
2) Then, we inject the faults in the system, and, finally, we design test cases that are specially designed to find these faults. Obviously, the success of such test cases is depends on the quality of the fault taxonomy. This different faults are occur during this different SOA steps which are shown in the following fig.5

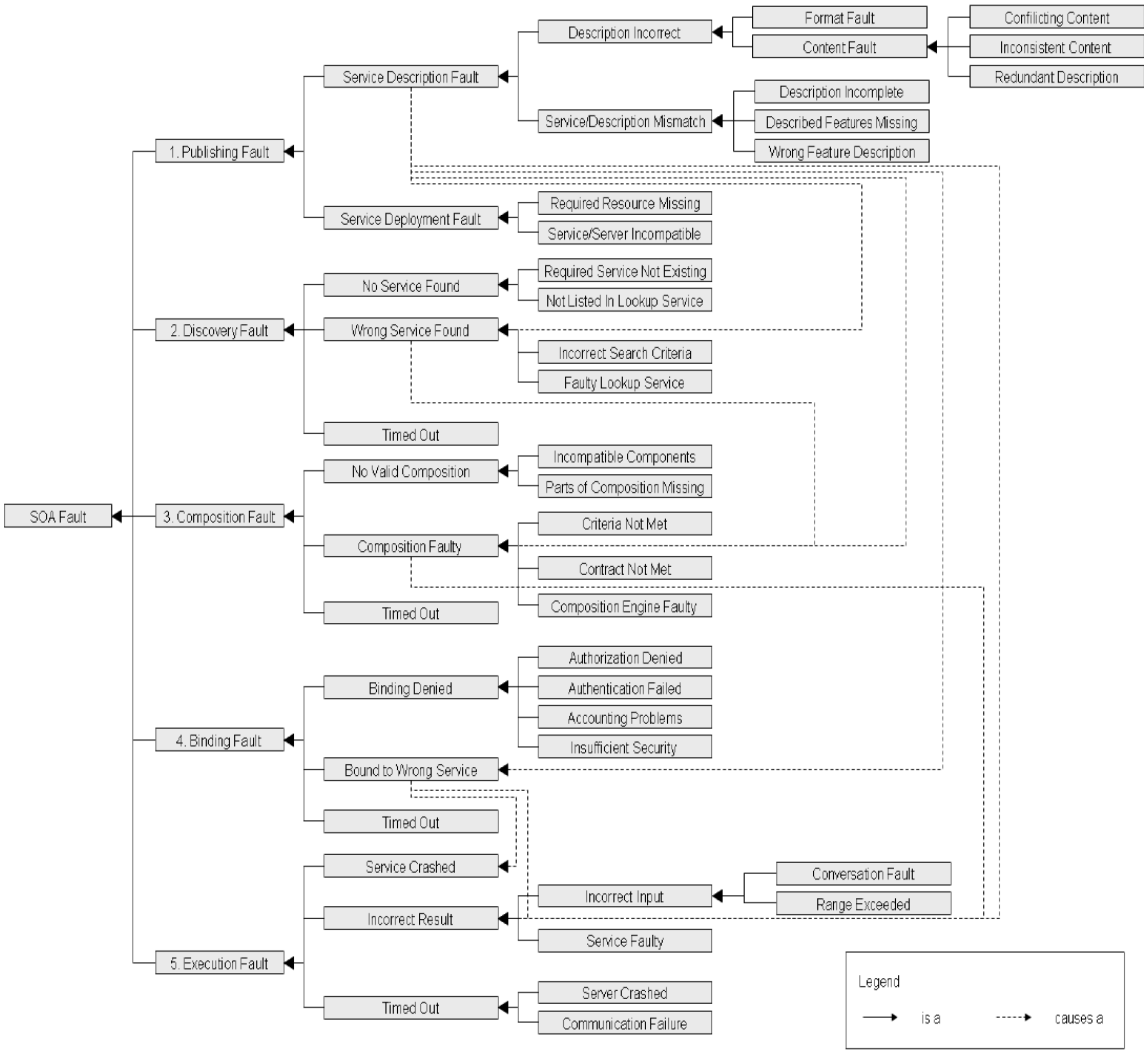


Fig.5 SOA-Specific Faults

In this project we are going to create one SOA interface which consist different services which we are going to access. As shown in fig.4 first two services are used to identify the all SOA specific faults ans the third mobile discovery service is use as one application which used to test the mobile device.

VII. CONCLUSION

Fault injection is a valid approach to examine the common fault detection mechanisms. The main benefit of our work is the identification of typical possible SOA-specific faults. The service invocation process consist five different steps which allow service discovery. The Stated faults knowledge is essential for testing. Testing is the commonly used support measure for high assurance of reliability, availability, and security. Testing via fault injection aims to cover as many fault classes a few test cases.

REFERENCES

[1] Jiang Bo, Long Xiang, Gao Xiaopeng "MobileTest: A Tool Supporting Automatic Black Box Test for Software onSmart Mobile Devices" 2007.
[2] Sun-Myung Hwang, Hyeon-Cheol Chae1" Design & Implementation of Mobile GUI Testing Tool" 2008.
[3] LIU Zhi-fang, GAO Xiao-peng "SOA Based Mobile Device Test" 2009.
[4] Myung-Hee Lee,1, Cheol-Jung Yoo1, Ok-Bae Jang1 "Embedded System Software Testing Based On SOA For Mobile Service".
[5] Zhi-fang LIU, Bin LIU "SOA Based Mobile Application Software Test Framework" .
[6] Stefan Br¨uning, Stephan Weißleder and Miroslaw Malek "A Fault Taxonomy for Service-Oriented Architecture".

New Travelling Waves Solutions for Solving Burger's Equations by Tan-Cot function method

[1,] Anwar Ja'afar Mohamad Jawad, [2,]Yusur Suhail Ali
1,2 Al-Rafidain University College, Baghdad, Iraq

Abstract:
In this paper, we used the proposed Tan-Cot function method for establishing a traveling wave solution to Burger's equations. The method is used to obtain new solitary wave solutions for various types of nonlinear partial differential equations such as, one-dimensional Burgers, KDV-Burgers, coupled Burgers, and the generalized time delayed Burgers' equations. Proposed method has been successfully implemented to establish new solitary wave solutions for Burgers nonlinear PDEs.

Keywords:*Nonlinear PDEs, Exact Solutions, tan-Cot function method, one-dimensional Burgers, KDV-Burgers, coupled Burgers, and the generalized time delayed.*

I. INTRODUCTION

Many phenomena in many branches of sciences such as physical, chemical, economical and biological processes are described by Burgers equations which provide the simplest nonlinear model of turbulence . The existence of relaxation time or delay time is an important feature in reaction diffusion and convection diffusion systems. The approximate theory of flow through a shock wave traveling is applied in viscous fluid [1]. Fletcher using the Hopf-Cole transformation [2] gave an analytic solution for the system of two dimensional Burgers' equations.Several numerical methods such as algorithms based on and implicit finite-difference scheme [3].Soliman [4] used the similarity reductions for the partial differential equations to develop a scheme for solving the Burgers' equation. High order accurate schemes for solving the two-dimensional Burgers' equations have been used [5].The variational iteration method was used to solve the one-dimensional Burgers and coupled Burgers' equations [6]. Anwar et al [1] used the Tanh method for the multiple exact complex solutions of some different kinds of nonlinear partial differential equations, and new complex solutions for nonlinear equations were obtained.

This paper is to extend the Tan- Cot function method to solve four different types of nonlinear differential equations such as the Burgers, KdV-Burgers, coupled Burgers and the generalized time delayed Burgers' equations given respectively by [1,7,8]

$$u_t + \alpha\, u\, u_x - \omega\, u_{xx} = 0, \quad (1)$$

$$u_t + \alpha\, u\, u_x - \omega\, u_{xx} + \mu\, u_{xxx} = 0, \quad (2)$$

$$u_t - u_{xx} + 2\, u\, u_x + \alpha (u\, v)_x = 0, \quad (3)$$

$$v_t - v_{xx} + 2\, v\, v_x + \beta (u\, v)_x = 0, \quad (4)$$

$$\tau\, u_{tt} + u_t + p\, u^s u_x - u_{xx} = 0 \quad (5)$$

Where ;$\alpha, \beta, \omega,$ and μ are arbitrary constants.

II. TAN-COT FUNCTION METHOD

Consider the nonlinear partial differential equation in the form

$$F(u, u_t, u_x, u_y, u_{tt}, u_{xx}, u_{xy}, u_{yy}, \dots\dots\dots) = 0 \quad (6)$$

where u(x, y, t) is a traveling wave solution of the nonlinear partial differential equation Eq. (6). We use the transformation,

$$u(x, y, t) = f(\xi) \quad (7)$$

Where

$$\xi = (kx + y + \lambda t) \quad (8)$$

where k, and λ are real constants. This enables us to use the following changes:

$$\frac{\partial}{\partial t}(.) = \lambda \frac{d}{d\xi}(.),\ \frac{\partial}{\partial x}(.) = k\frac{d}{d\xi}(.),\ \frac{\partial}{\partial y}(.) = \frac{d}{d\xi}(.) \tag{9}$$

Using Eq. (8) to transfer the nonlinear partial differential equation Eq. (6) to nonlinear ordinary differential equation

$$Q(f, f', f'', f''', \ldots\ldots\ldots\ldots) = 0 \tag{10}$$

The order of the ordinary differential equation Eq.(10) can be reduced by integrating the equation providing that all the terms contain derivatives. The solutions of many nonlinear equations can be expressed in the form [9]:

$$f(\xi) = \alpha \tan^{\beta}(\mu\xi)\ ,\qquad |\xi| \le \frac{\pi}{2\mu}$$

or in the form (11)

$$f(\xi) = \alpha \cot^{\beta}(\mu\xi)\ ,\qquad |\xi| \le \frac{\pi}{2\mu}$$

Where α ,μ, and β are parameters to be determined, μ is the wave number. We use

$$\begin{aligned} f(\xi) &= \alpha \tan^{\beta}(\mu\xi) \\ f'(\xi) &= \alpha\beta\mu\ [\tan^{\beta-1}(\mu\xi) + \tan^{\beta+1}(\mu\xi)] \\ f''(\xi) &= \alpha\beta\mu^2[(\beta-1)\tan^{\beta-2}(\mu\xi) + 2\beta\tan^{\beta}(\mu\xi) + (\beta+1)\tan^{\beta+2}(\mu\xi)] \end{aligned} \tag{12}$$

and their derivative. Or use

$$\begin{aligned} f(\xi) &= \alpha \cot^{\beta}(\mu\xi) \\ f'(\xi) &= -\alpha\beta\mu\ [\cot^{\beta-1}(\mu\xi) + \cot^{\beta+1}(\mu\xi)] \\ f''(\xi) &= \alpha\beta\mu^2[(\beta-1)\cot^{\beta-2}(\mu\xi) + 2\beta\cot^{\beta}(\mu\xi) + (\beta+1)\cot^{\beta+2}(\mu\xi)] \end{aligned} \tag{13}$$

and so on. We substitute Eq.(12) or Eq.(13) into the reduced equation (10), balance the terms of the tan functions when Eq.(12) are used, and solve the resulting system of algebraic equations by using computerized symbolic packages. We next collect all the terms with the same power in $\tan^{k}(\mu\xi)$ and set to zero their coefficients to get a system of algebraic equations among the unknown'sα , μ and β and solve the subsequent system.

III. APPLICATIONS

the Tan- Cot function method is implemented to solve four different types of nonlinear differential equations such as the Burgers, KdV-Burgers, coupled Burgers and the generalized time delayed Burgers' equations.

3.1 One-dimensional Burgers' equation

Consider the one-dimensional Burgers' equation which has the form[1];

$$u_t + \delta\, u\, u_x - \omega\, u_{xx} = 0 \tag{14}$$

Where α and ω are arbitrary constants. In order to solve Eq. (14) by the Tan method, we use the wave transformation $u(x,t) = U(\xi)$, with wave variable $\xi = (x + \lambda t)$, Eq. (14) takes the form of an ordinary differential equation.

$$\lambda U' + \delta\, U\, U' - \omega\, U'' = 0 \tag{15}$$

Integrating Eq. (15) once with respect to ξ and setting the constant of integration to be zero, we obtain:

$$\lambda U + \frac{1}{2}\delta\, U^2 - \omega\, U' = 0 \tag{16}$$

Seeking the solution in eq.(11)

$$\lambda \tan^{\beta}(\mu\xi) + \frac{1}{2}\delta\,\alpha \tan^{2\beta}(\mu\xi) - \omega\,\beta\,\mu\,[\tan^{\beta-1}(\mu\xi) + \tan^{\beta+1}(\mu\xi)] = 0 \quad (17)$$

Equating the exponents and the coefficients of each pair of the tan functions we find the following algebraic system:

$$2\beta = \beta + 1 \;\rightarrow \beta = 1 \quad (18)$$

Substituting Eq. (18) into Eq. (17) to get:

$$\alpha = \frac{2\omega\,\mu}{\delta} \quad (19)$$

Then by substituting Eq.(19) into Eq.(12), the solution of equation (14) can be written in the form

$$u(x,t) = \frac{2\omega\,\mu}{\delta} \tan\,(\mu(x+\lambda t)) \quad (20)$$

For $\mu = \lambda = 1, \omega = 0.5\,,\ \delta = 0.1$Eq.(20) becomes

$$u(x,t) = 10\ \tan\ (x + t) \quad (21)$$

3.2 KdV-Burgers' equation

Another important example is the KdV-Burgers' equation [1], which can be written as

$$u_t + \delta\,u\,u_x - \omega\,u_{xx} + \rho\,u_{xxx} = 0 \quad (22)$$

Where $\alpha, \omega,$ and μ are arbitrary constants. In order to solve Eq. (22) by the tan method, we use the wave transformation $u(x,t) = U(\xi)$, with wave variable $\xi = (x + \lambda\,t)$, : Eq. (22) takes the form of an ordinary differential equation

$$\lambda U' + \frac{1}{2}\delta\,(U^2)' - \omega\,U'' + \rho\,U''' = 0 \quad (23)$$

Integrating Eq. (23) once with respect to ξ and setting the constant of integration to be zero, we obtain:

$$\lambda U + \frac{1}{2}\delta\ U^2 - \omega\,U' + \rho\,U'' = 0 \quad (24)$$

Seeking the method in (12)

$$\lambda\ \tan^{\beta}(\mu\xi) + \frac{1}{2}\delta\ \alpha \tan^{2\beta}(\mu\xi) - \omega\,\beta\,\mu\,[\tan^{\beta-1}(\mu\xi) + \tan^{\beta+1}(\mu\xi)] + \rho\ \beta\mu^2[(\beta-1)\ \tan^{\beta-2}(\mu\xi) + 2\beta\ \tan^{\beta}(\mu\xi) + (\beta+1)\tan^{\beta+2}(\mu\xi)] = 0 \quad (25)$$

Equating the exponents and the coefficients of each pair of the tan function, we obtain

$$2\beta = \beta + 1\ \text{, so that } \beta = 1 \quad (26)$$

Substitute (26) into (25) give the following system of equations

$$\lambda + 2\rho\mu^2 = 0$$
$$\frac{1}{2}\delta\ \alpha\ - \omega\,\mu = 0 \quad (27)$$

Then by solving system (27) to get:

$$\lambda = -2\,\rho\ \mu^2\,,\quad \alpha = 2\,\frac{\omega\,\mu}{\delta} \quad (28)$$

Then by substituting Eq.(28) into Eq.(12), the exact soliton solution of the system of equation (22)can be written in the form

$$u(x,t) = 2\,\frac{\omega\,\mu}{\delta}\,\tan(\mu\,(x - 2\,\rho\,\mu^2 t)\,) \qquad (29)$$

For $\mu = \rho = 1$, $\omega = 0.5$, $\delta = 0.1$ Eq.(22) becomes

$$u(x,t) = 10\,\tan(x - 2\,t) \qquad (30)$$

3.3 Coupled Burgers' equations

The third instructive example is the homogeneous form of a coupled Burgers' equations [1]. We will consider the following system of equations

$$u_t - u_{xx} + 2\,u\,u_x + \delta(u\,v)_x = 0 \qquad (31)$$

$$v_t - v_{xx} + 2\,v\,v_x + \gamma(u\,v)_x = 0 \qquad (32)$$

In order to solve Eqs. (31,32) by the tan method. We use the wave transformations u(x; t) = U(ξ) and v(x; t) = V(ξ) with wave variable ξ = (x + λt): Eqs. (31,32) take the form of ordinary differential equations

$$\lambda\,U' - U'' + 2\,UU' + \delta\,(UV)' = 0 \qquad (33)$$

$$\lambda V' - V'' + 2VV' + \gamma\,(UV)' = 0 \qquad (34)$$

Integrating Eqs. (33,34) once with respect to ξ and setting the constant of integration to zero, we obtain

$$\lambda U - U' + U^2 + \delta\,UV = 0 \qquad (35)$$

$$\lambda\,V - V' + V^2 + \gamma UV = 0 \qquad (36)$$

Let :

$$U = \alpha_1\,\tan^{\beta_1}(\mu\xi) \qquad (37)$$

$$V = \alpha_2\,\tan^{\beta_2}(\mu\xi) \qquad (38)$$

$$U' = \alpha_1\beta_1\,\mu\,[\,\tan^{\beta_1 - 1}(\mu\xi) + \tan^{\beta_1 + 1}(\mu\xi)] \qquad (39)$$

$$V' = \alpha_2\beta_2\,\mu\,[\,\tan^{\beta_2 - 1}(\mu\xi) + \tan^{\beta_2 + 1}(\mu\xi)] \qquad (40)$$

Substitute (37-38) and their derivatives then (35,36) become

$$\lambda\,\tan^{\beta_1}(\mu\xi) - \beta_1\,\mu\,[\,\tan^{\beta_1 - 1}(\mu\xi) + \tan^{\beta_1 + 1}(\mu\xi)] + \alpha_1\,\tan^{2\beta_1}(\mu\xi) + \delta\,\alpha_2\,\tan^{\beta_1+\beta_2}(\mu\xi) = 0 \qquad (41)$$

and

$$\lambda\,\tan^{\beta_2}(\mu\xi) - \beta_2\,\mu\,[\,\tan^{\beta_2 - 1}(\mu\xi) + \tan^{\beta_2 + 1}(\mu\xi)] + \alpha_2\,\tan^{2\beta_2}(\mu\xi) + \gamma\,\alpha_1\tan^{\beta_1+\beta_2}(\mu\xi) = 0 \qquad (42)$$

Equating the exponents and the coefficients of each pair of the tan function, we obtain

$\beta_1 + 1 = \beta_1 + \beta_2$, so that $\beta_2 = 1$

$\beta_1 + \beta_2 = 2\beta_2$, so that $\beta_1 = 1$

Substitute $\beta 1 = 1$, and $\beta 2 = 1$ into (41), and (42) give the following system of equations

$$-\mu + \alpha_1 + \delta\,\alpha_2 = 0$$

$$-\mu + \alpha_2 + \gamma\,\alpha_1 = 0 \qquad (43)$$

Solving system (43) then:

$$\alpha_1 = \frac{[1-\delta]}{[1-\delta\gamma]}\,\mu\ ,\ \alpha_2 = \frac{[1-\gamma]}{[1-\delta\gamma]}\,\mu \qquad (44)$$

Then by substituting Eq.(44) into Eqs.(37), (38), the exact solution of the system of equations (31) and (32) can be written in the form

$$u(x,t) = \frac{[1-\delta]}{[1-\delta\gamma]}\ \mu \tan\ (\mu(x + \lambda t)\ ) \quad (45)$$

$$v(x,t) = \frac{[1-\gamma]}{[1-\delta\gamma]}\mu \tan\ (\mu(x + \lambda t)\ ) \quad (46)$$

For $\mu = \lambda = 1,\ \delta = \gamma = 0.5$

$$u(x,t) = \frac{2}{3}\tan(x + t) \quad (47)$$

$$v(x,t) = \frac{2}{3}\tan(x + t) \quad (48)$$

3.4 Generalized time-delayed Burgers equation

The time-delayed Burgers equation [1,8] is given by

$$\tau u_{tt} + u_t + p\, u^s u_x - u_{xx} = 0 \quad (49)$$

we use the wave transformation $u(x,t) = U(\xi)$, with wave variable $\xi = (x + \lambda t)$, Eq. (49) takes the form of an ordinary differential equation

$$(\lambda^2 \tau - 1)U'' + (p\, U^s + \lambda)\, U' = 0 \quad (50)$$

Seeking the method in (12), Eq. (50) becomes

$$(\lambda^2 \tau - 1)\, \alpha\, \beta\mu^2\, [(\beta - 1)\ \tan^{\beta-2}(\mu\xi) + 2\beta\ \tan^{\beta}(\mu\xi) + (\beta + 1)\tan^{\beta+2}(\mu\xi)] + (\, p\alpha^s \tan^{s\beta}(\mu\xi) + \lambda)\ \ \alpha\, \beta\, \mu\ [\tan^{\beta-1}(\mu\xi) + \tan^{\beta+1}(\mu\xi)] = 0 \quad (51)$$

Equating the exponents and the coefficients of each pair of the tan function, we obtain

$$(\lambda^2 \tau - 1)\, \mu\, [(\beta - 1)\ \tan^{\beta-2}(\mu\xi) + 2\beta\ \tan^{\beta}(\mu\xi) + (\beta + 1)\tan^{\beta+2}(\mu\xi)] + p\, \alpha^s \tan^{s\beta+\beta-1}(\mu\xi) + p\, \alpha^s\ \tan^{s\beta+\beta+1}(\mu\xi) + \lambda \tan^{\beta-1}(\mu\xi) + \lambda\ \tan^{\beta+1}(\mu\xi) = 0 \quad (52)$$

Then:

$$s\beta + \beta + 1 = \beta + 2\ ,\ \text{so that}\ \beta = \frac{1}{s} \quad (53)$$

Substitute (53) into (52) give

$$\alpha = \left[\frac{2\,(1-\lambda^2\,\tau)}{s\,p}\,\mu\right]^{\frac{1}{s}} \quad (54)$$

Then by substituting Eq.(54) into Eq.(12), the exact solution of equation (49) can be written in the form

$$u(x,t) = \left[\frac{2\,(1-\lambda^2\,\tau)}{s\,p}\,\mu\right]^{\frac{1}{s}}\ \tan^{\frac{1}{s}}(\mu(x + \lambda t)\ ) \quad (55)$$

For $\mu = \lambda = p = s = 1,\ \tau = .5$,Eq.(55) becomes

$$u(x,t) = \tan(x + t) \quad (56)$$

IV. CONCLUSION

In this paper, the tan-cot function method has been successfully implemented to establish new solitary wave solutions for various types of nonlinear PDEs. We can say that the proposed method can be extended to solve the problems of nonlinear partial differential equations which arising in the theory of solitons and other areas.

REFERENCES

[1] Anwar Ja'afar Mohamad Jawada, Marko D. Petkovićb, Anjan Biswasc, Soliton solutions of Burgers equations and perturbed Burgers equation, Applied Mathematics and ComputationVolume 216, Issue 11, pp. 3370–3377(2010).

[2] J. D. Fletcher, Generating exact solutions of the two-dimensional Burgers' equations. Int. J. Numer. Meth.Fluids. 3:213-216(1983).

[3] A. R. Bahadir, A fully implicit finite-difference scheme for two-dimensional Burgers' equations. Appl. Math. Comput. 137: 131-137(2003).

[4] A. A. Soliman, New numerical technique for Burger's equation based on similarity reductions. International Conference on Computational Fluid Dynamics.Beinjing China October 17-20:559-566 (2000).

[5] C. J. Fletcher: A comparison of finite element and finite difference solutions of the one-and two dimensional Burgers' equations. J. Comput. Phys. 51:159 (1983).

[6] M. A. Abdou, A. A. Soliman: Variational iteration method for solving Burger's and coupled Burger's equations. Journal of Computational and Applied Mathematics. 181(2):245-251 (2005).

[7] P.C. Jain, D. N. Holla: Numerical solution of coupled Burgers ¢ equations. Int. J. Numer. Meth.Eng.12:213-222(1978)

[8] E.S. Fahmy, Exact solution of the generalized time-delayed Burger's equation through the improved tanh-function method,http://faculty.ksu.edu.sa/72323/Publications/Paper.pdf

[9] A. J. M Jawad, New Exact Solutions of Nonlinear Partial Differential Equations Using Tan-Cot Function Method, Studies in Mathematical Sciences, Vol. 5, No. 2, pp.13-25 (2012).

Design and Analysis of Gas Turbine Combustion Chamber

P.Sravan Kumar[1], P.Punna Rao[2]

[1]PG Student, Department of Mechanical Engineering, Nimra College of Engineering & Technology.
[2]Assistant Professor, Department of Mechanical Engineering, Nimra College of Engineering & Technology, Vijayawada, AP, INDIA

Abstract

The design and analysis of gas turbine combustion chamber is based on combined theoretical and empirical approach and the design of combustion chamber is a less than exact science. This paper presents the design of combustion chamber followed by three dimensional simulations to investigate the velocity profiles, species concentration and temperature distribution within the chamber and the fuel considered as Methane (CH4). The computational approach attempts to strike a reasonable balance to handle the competing aspects of complicated physical and chemical interactions of the flow. The modeling employs non-orthogonal curvilinear coordinates, second order accurate discretization, tetra grid iterative solution procedure and SST turbulence model. Accordingly, in present study an attempt has been made through CFD approach using ANSYS CFX 12 to analyze the flow pattern with in combustion and through air admission holes and from these the temperature distribution in the chamber walls as well as the temperature quality at the exit of combustion chamber is obtained.

Keywords: *Ansys, CATIA, CFD, Combustion Chamber, Empirical approach.*

I. INTRODUCTION

The development of the gas turbine engine as an aircraft power plant has been so rapid that it is difficult to appreciate that prior to the 1950s very few people had heard of this method of aircraft propulsion. The possibility of using a reaction jet had interested aircraft designers for a long time, but initially the low speeds of early aircraft and the unsuitably of a piston engine for producing the large high velocity airflow necessary for the 'jet' presented many obstacles.

II. PRINCIPLES OF JET PROPULSION

Jet propulsion is a practical application of Sir Isaac Newton's third law of motion which states that, 'for every force acting on a body there is an opposite and equal reaction'. For aircraft propulsion, the 'body' is atmospheric air that is caused to accelerate as it passes through the engine. The force required to give this acceleration has an equal effect in the opposite direction acting on the apparatus producing the acceleration. A jet engine produces thrust in a similar way to the engine/propeller combination. Both propel the aircraft by thrusting a large weight of air backwards (fig. 1), one in the form of a large air slipstream at comparatively low speed and the other in the form of a jet of gas at very high speed.

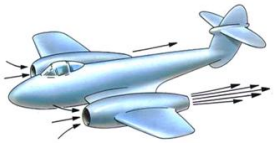


Fig.1 Thrusting aircraft by propel

This same principle of reaction occurs in all forms of movement and has been use fully applied in many ways. The earliest known example of jet reaction is that of Hero's engine (fig.2) produced as a toy in120 B.C. This toy showed how the momentum of seam issuing from a number of jets could impart an equal and opposite reaction to the jets themselves, thus causing the engine to revolve.

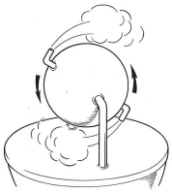


Fig.2 Toy propulsion

The familiar whirling garden sprinkler is a more practical example of this principle, for the mechanism rotates by virtue of the reaction to the water jets. The high pressure jets of modern firefighting equipment are an example of 'jet reaction', for often, due to the reaction of the water jet, the hose cannot be held or controlled by one fireman. Perhaps the simplest illustration of this principle is afforded by the carnival balloon which, when the air or gas is released, rushes rapidly away in the direction opposite to the jet.

Jet reaction is definitely an internal phenomenon and does not, as is frequently assumed, result from the pressure of the jet on the atmosphere. In fact, the jet propulsion engine, whether rocket, athodyd, or turbo-jet, is a piece of apparatus designed to accelerate a stream of air or gas and to expel it at high velocity. The engine is proportional to the mass or weight of air expelled by the engine and to the velocity change imparted to it. In other words, the same thrust can be provided either by giving a large mass of air a little extra velocity or a small mass of air a large exit velocity. In practice the former is preferred, since by lowering the jet velocity relative to the atmosphere a higher propulsive efficiency is obtained.

III. COMBUSTION CHAMBER

The combustion chamber (fig.3) has the difficult task of burning large quantities of fuel, supplied through the fuel spray nozzles, with extensive volumes of air, supplied by the compressor and releasing the heat in such a manner that the air is expanded and accelerated to give a smooth stream of uniformly heated gas at all conditions required by the turbine. This task must be accomplished with the minimum loss in pressure and with the maximum heat release for the limited space available. The amount of fuel added to the air will depend upon the temperature rise required. However, the maximum temperature is limited to within the range of 850 to 1700 deg. C. by the materials from which the turbine blades and nozzles are made. The air has already been heated to between 200 and550 deg. C. by the work done during compression, giving a temperature rise requirement of 650 to 1150 deg. C. from the combustion process. Since the gas temperature required at the turbine varies with engine thrust, and in the case of the turbo-propeller engine upon the power required, the combustion chamber must also be capable of maintaining stable and efficient combustion over a wide range of engine operating conditions. Efficient combustion has become increasingly important because of the rapid rise in commercial aircraft traffic and the consequent increase in atmospheric pollution, which is seen by the general public as exhaust smoke.

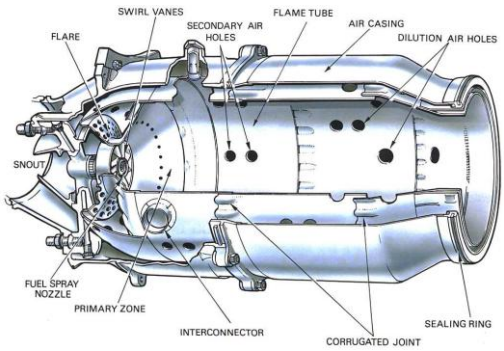


Fig.3 Combustion chamber

IV. COMBUSTION PROCESS

Air from the engine compressor enters the combustion chamber at a velocity up to 500 feet per second, but because at this velocity the air speed is far too high for combustion, the first thing that the chamber must do is to diffuse it, i.e. decelerate it and raise its static pressure. Since the speed of burning kerosene at normal mixture ratios is only a few feet per second, any fuel lit even in the diffused air stream, which now has a velocity of about 80 feet per second, would be blown away. A region of low axial velocity has therefore to be created in the chamber, so that the flame will remain alight throughout the of a combustion chamber can vary between 45:1 and130:1, However, kerosene will only burn efficiently at, or close to, a ratio of 15:1, so the fuel must be burned with only part of the air entering the chamber, in what is called a primary combustion zone. This is achieved by means of a flame tube (combustion liner) that has various devices for metering the airflow distribution along the chamber.

Approximately 20 per cent of the air mass flow is taken in by the snout or entry section (fig.4).Immediately downstream of the snout are swirl vanes and a perforated flare, through which air passes into the primary combustion zone. The swirling air induces a flow upstream of the centre of the flame tube and promotes the desired recirculation. The air not picked up by the snout flows into the annular
Space between the flame tube and the air casing.

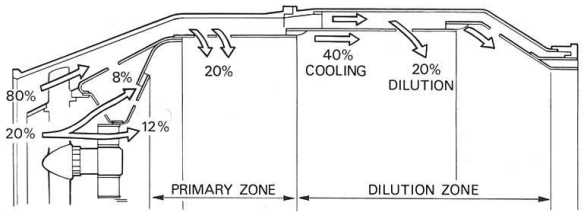


Fig.4 Airflow distribution along the chamber

Through the wall of the flame tube body, adjacent to the combustion zone, are a selected number of secondary holes through which a further 20 per cent of the main flow of air passes into the primary zone. The air from the swirl vanes and that from the secondary air holes interacts and creates a region of low velocity recirculation. This takes the form of a toroidal vortex, similar to a smoke ring, which has the effect of stabilizing and anchoring the flame (fig,5).The re-circulating gases hasten the burning of freshly injected fuel droplets by rapidly bringing them to ignition temperature.

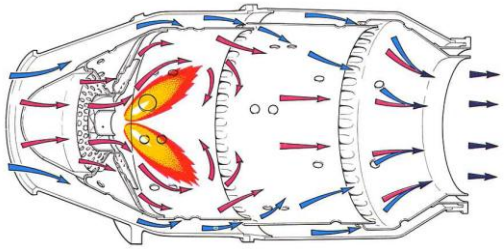


Fig.5 Smoke ring

It is arranged that the conical fuel spray from the nozzle intersects the recirculation vortex at its centre. This action, together with the general turbulence in the primary zone, greatly assists in breaking up the fuel and mixing it with the incoming air. The temperature of the gases released by combustion is about 1,800 to 2,000 deg. C., which is far too hot for entry to the nozzle guide vanes of the turbine. The air not used for combustion, which amounts to about 60 per cent of the total airflow, is therefore introduced progressively into the flame tube. Approximately a third of this is used to lower the gas temperature in the dilution zone before it enters the turbine and the remainder is used for cooling the walls of the flame tube. This is achieved by a film of cooling air flowing along the inside surface of the flame tube wall, insulating it from the hot combustion gases. A recent development allows cooling air to enter a network of passages within the flame tube wall before exiting to form an insulating film of air, this can reduce the required wall cooling airflow by up to 50 per cent. Combustion should be completed before the dilution air enters the flame tube, otherwise the incoming air will cool the flame and incomplete combustion will result.

1. Modeling using Catia

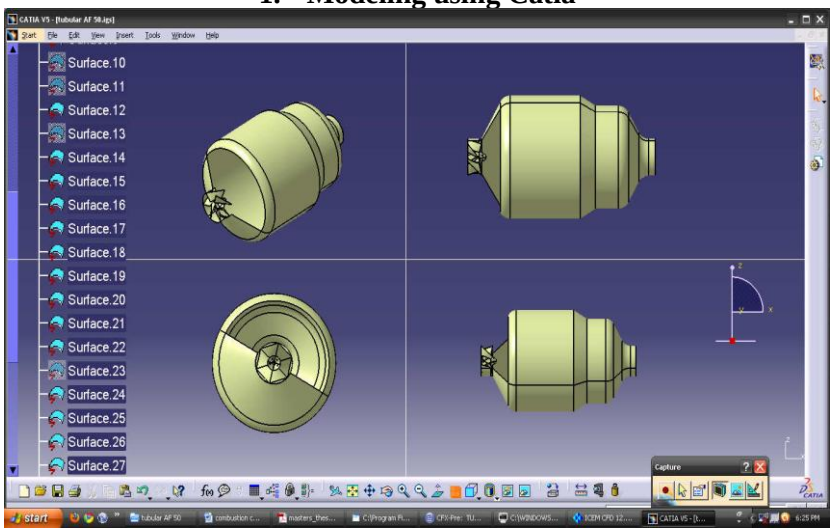


Fig.6 Combustion chamber model in Catia

2. Analysis by using Ansys

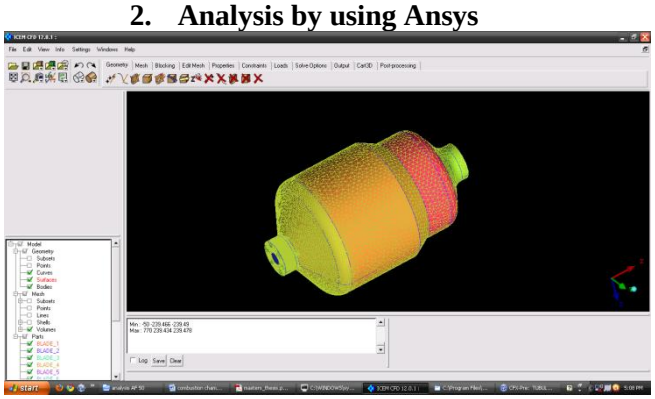


Fig.7 Mesh model of a can-annular combustion chamber

3. Results & Discussion

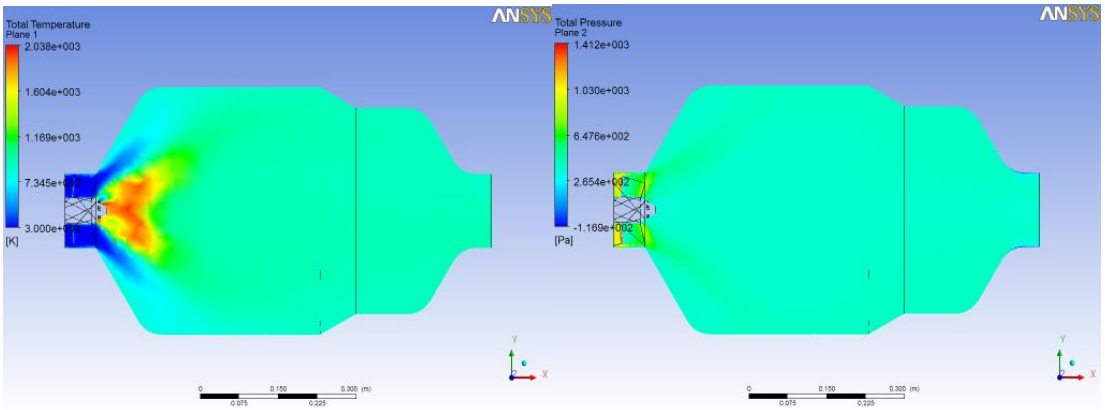


Fig.8 Total temperature **Fig.9** Total pressure

Fig 8 indicates the pressure variations in the combustion chamber. The temperature within the combustion chamber is about 2500k .in the Fig 1 the blue colored region area indicates the air. The red colored region area indicates the reaction of air with fuel particles. This air is reacted with the fuel particles and produce large amount of heat. This heat is occupies the total combustor and comes out at outlet.

Fig.9 indicates the total pressure variation in the combustion chamber .according to this fig the total pressure throughout the combustion chamber is equal so the combustion chamber is in stable condition. The pressure at the boundaries of a combustion chamber is constant. so there is no much effect on the combustion chamber.

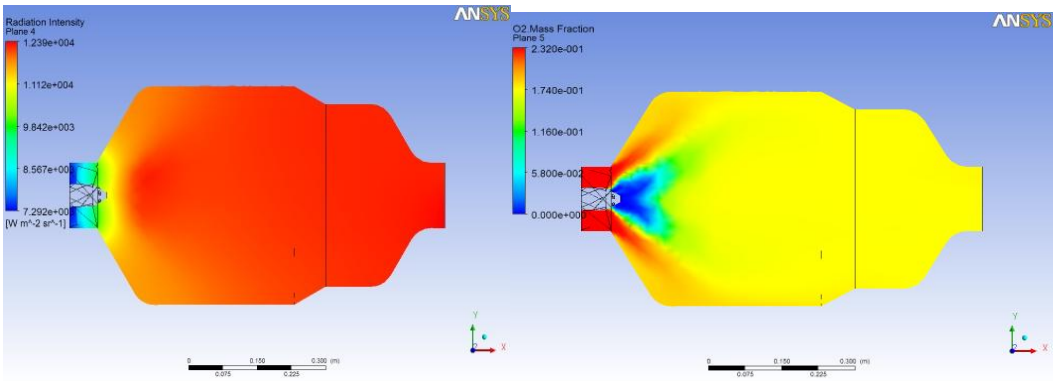


Fig.10 Radiation intensity **Fig.11** Mass fraction

Fig.10 indicates the radiation intensity throughout the combustion chamber. The radiation intensity is constant on walls of a combustion chamber .the radiation intensity is increased from one end to another end. The intensity at collision of air and fuel particles is minimum and it will be increased to end. At the end of a chamber the intensity is maximum. The red color region area indicates the radiation intensity.

Fig.11 indicates the oxygen mass fraction. The oxygen is entered from the air inlets. In air 21% oxygen is present this oxygen is react with the fuel which is comes from the fuel inlets. The combustion process is takes places because of this oxygen. The red colored region indicates the oxygen concentration. The blue colored region is fuel .the concentration of air is decreased because of combustion process.

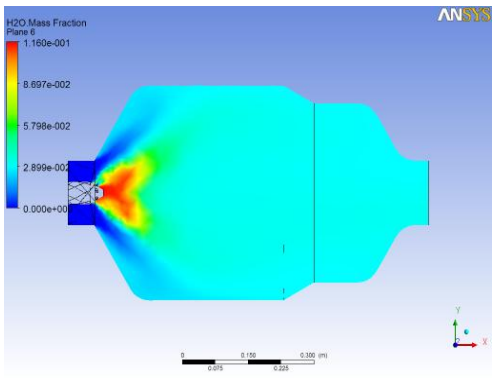


Fig.12 H_2O mass fraction

Fig.12 indicates the water mass fraction in the air. The water mass fraction is gradually decreased in the combustion chamber because of combustion process. The blue colored region area is indicates the water in air .this H2O comes from the air inlets with air. The concentration of water molecules is decreased because large amount of heat is produced during the combustion process so the water molecules are evaporated easily.

The temperature of the gas has increased to approximately 2500 K which may leads to combustion process. Pattern factor lies in between 0.025-0.3 and pressure loss should be below 8% for good combustion process.

V. CONCLUSION

The above analysis reaches to the following conclusions mentioned below:

- The static temperature is very high in the regions where combustion takes place and goes on decreasing towards the outlet. The maximum temperature reached is 2500 K which indicates that there is efficient combustion process.
- The turbulent intensity is high in the immediate vicinity of the ramp injector indicating a superior air-fuel mixing. It is of the order of 60000% with respect to the turbulent intensity at the inlet. A very high turbulent intensity indicates a superior air-fuel mixing. The high value of mass fraction of NO formed indicates an efficient combustion process.
- The sudden rise in temperature observed near the tip of the injector indicates the generation of shocks which help in superior air-fuel mixing. Superior air-fuel mixing resulting in better quality of combustion and thus better performance. As predicted, the results obtained from this study show an enhanced air-fuel mixing and a proper combustion which can be attributed to the geometry of the ramp injector considered in this study.

  However in has to be in process the outlet temperature has to maintain pattern factor below 0.3 and at the same pressure loss should be less than 8%.

REFERENCES

[1]. THE JET ENGINES - *Rolls-Royce*
[2]. AIRCRAFT PROPULSION by FAROOKI
[3]. MODELING OF COMBUSTION SYSTEMS: A Practical Approach by Joseph Colannino .
[4]. COMBUSTION CHAMBERS FOR JET PROPULSION ENGINES by V. S. And L. S. Skubachevskii Zuyev
[5]. DEVELOPMENT OF AERO GAS TURBINE ANNULAR COMBUSTOR: BY Dr. C. DARINATHCombustion group.
[6]. GAS TURBAINS AND JET PROPULSION - M.J. Sable
[7]. SOME RELEVENT DATA FROM WIKIPEDIA .
[8]. CFD Analysis of Rocket Engine Combustion Chambers by J. Steelant in ESTEC, 9-10th of October 2003.
[9]. Optimization of combustion chamber for diesel engine using kriging model by shinkyu JEONG in JFST V-1,No-2,2006.

Design & Analysis of a Two-jaw parallel Pneumatic Gripper

Mohammed.Khadeeruddin[1], T.V.S.R.K Prasad[2], Raffi Mohammed[3]

[1]*PG Student, Department of Mechanical Engineering, Nimra college of Engineeri*[2]*Assistant Professor, Department of Mechanical Engineering ng and Technology.*

[2]*Professor & HOD, Department of Mechanical Engineering, Nimra College of Engineering & Technology, Vijayawada, AP, INDIA*

3Assistant Professor, Department of Mechanical Engineering, NRI institute of Technology, Vijayawada, AP, INDIA

Abstract:

The handling of abstract materials and mechanisms to pick and place are widely found in factory automation and industrial manufacturing. There are different mechanical grippers which are based on different motor technologies have been designed and employed in numerous applications. The designed robotic gripper in this paper is a two jaw actuated gripper which is different from the conventional cam and follower gripper in the way that controlled movement of the jaws is done with the help of pneumatic cylinders using air pressure. The force developed in the cylinder is very gentle and is directly delivered to the jaws in a compact way. The design, analysis and fabrication of the gripper model are explained in details along with the detailed list of all existing pneumatic grippers in market. The force and torque for the gripper have been calculated for different set of conditions. The working of the model is checked for and observation for pay load is recorded at various pressures. The highly dynamic and highly accelerated gripper model can be easily set at intermediate positions by regulating the pressure. Pneumatic grippers are very easy to handle and are generally cost-effective because air hoses, valves and other pneumatic devices are easy to maintain.

Keywords: *Automation, air hoses, Ansys, gripper, jaws, Pro-E.*

I. INTRODUCTION

Compressed Air is the air under pressure having values much greater than that of the atmosphere. When this compressed air is expanded to a lower pressure, a piston can be pushed using it, such as that in a jackhammer; it can go through small air turbines to turn shaft, as in a high-speed dental drill; or it can be expanded through a nozzle to produce a high-speed jet as in a paint sprayer. There are many pneumatic devices in which compressed air becomes a source of energy to perform various operations which includes riveting guns, air powered hammers, drills such as rock drills and other air powered tools. There are methods to use compressed air in coal mining tools thus reducing any chances of explosion which happens in case of electric tools which generally produces spark.

II. WORKING PRINCIPLE

The parallel jaw gripper has at least two fingers which can be moved towards each other along one axis. Usually, the fingers can be moved independently from each other in order not to shift the object, but they are only able to perform simple operations like open and close. Thereby, a longitudinal or side movement is impossible. A parallel jaw perform, a manual control to steer the gripper must be possible for enabling the highest flexibility.

- **The principles which are followed in this type of parallel jaw gripper are:**

The force closure grip:

- The characteristic of the force closure grip is that the gripper keeps the object in a stable state by compensating all forces and torques created by the object. The sum of all forces and sum of all torques must equal zero($\Sigma F=0;\Sigma M=0$).

  The force closure grip can be differentiated into a grip with friction and without friction. The force closure grip without friction is much idealized and not very common in daily use; therefore it is no further mentioned. The force closure grip with friction requires at least contact points for gripping a planar object and at least 4 contact points for a three-dimensional object.

- The form closure grip is the second principle for gripping objects. This grip is feasible, because the gripper is a negative model of the object (or a part of it) which limits the movement of the object within the gripper in any direction, also when changing the gripper orientation.
- The force is compensated on well specified contact surfaces. Tangential load, pressure load and torque are not considered, but are instead reduced to the corresponding forces. The gripper must either make use of a special geometry (i.e. negative model of the object), or a significant number of fingers are required.

When compressed air is released from the compressor through the pressure regulator, it rapidly flows into the 5/2 way valve. The desired pressure level can be maintained by observing the pressure readings on the dial gauge. The maximum pressure at which the system can be operated is 10 bar, but mostly we will be working at pressure levels far below that, preferably less than 5 bar. The compressed air moves into the 5/2 way valve which when activated either manually or by solenoid electric circuit allows the compressed air into the inlet port of the two double acting air cylinder(max supply pressure of 10 bar) which are placed exactly opposite to each other. A 5/2 way valve could be used in place of a 5/3 way valve which is an advanced valve which regulates the amount of compresses air flow, thus controlling the stroke length of the piston rods. The cylinder has a bore diameter of 50 mm and stroke of 50 mm too.

The entry of air into the cylinder pushes the piston and thus the piston rods undergoes a power stroke to move outwards which increases the distance between the gripper surfaces .Thus this movement opens the grippers which helps in releasing the object. For the other way round, when the compressed air flow is reversed then the air flows out from the cylinder into the valve and into the compressor through the regulator. This accounts for the return stroke of the piston rod which helps to grasp the load as the distance between the gripper surfaces decreases. The pressure is maintained as per the gripping force which is required. The distance between the grippers is the width of the object which is required to be grasped.

III. ROBOTIC GRIPPERS

These are the type of robots which have the capability to grasp definite objects and then reposition it according to requirement. The robotic grippers have two basic parts. They are the manipulators and end effectors. The manipulators are the working arm of the robot whereas the End effectors are the hands of the robot. Generally the robots are connected with replaceable end effectors for which they can perform wide range of functions with same fixed manipulators. The end effectors are actuated by various mechanisms which include mechanical drives, electrical drives, hydraulic drives and Pneumatic drives. Among this the widely used one is the hydraulic grippers but the most favorable one is the pneumatic gripper.

A robot gripper is a type of end of arm tooling (EOAT). It is used to pick up items and can be customized for your application. One of the most important aspects of the robot is its EOAT (End of Arm Tooling). A robot gripper serves as the physical interface that a robot performs an application.

Fig.1 Robotic gripper

- **There are four robot gripper types:**
  - Vacuum grippers,
  - Pneumatic grippers,
  - Hydraulic grippers,
  - Servo-electricgrippers.

IV. GRIPPER FORCE REQUIREMENTS

The type of gripper jaws which is used generally has a major role in determining the force which is required in the functioning of a gripper. The gripper jaws are generally of 2 types or are found in two styles:

- Friction grip
- Encompassing grip.

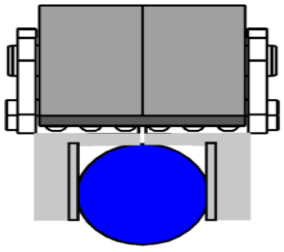


Fig.2 Friction grip

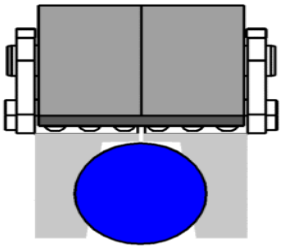


Fig.3 Encompassing grip.

1. **Calculations:-**

Gripping force: - $2\mu Fg=mg$

Max actuating force: - $F= P_a*(\pi D^2/4)$

V. CIRCUIT CONNECTION

This is how a pneumatic robotic gripper acts and the calculations required for the design are as follows

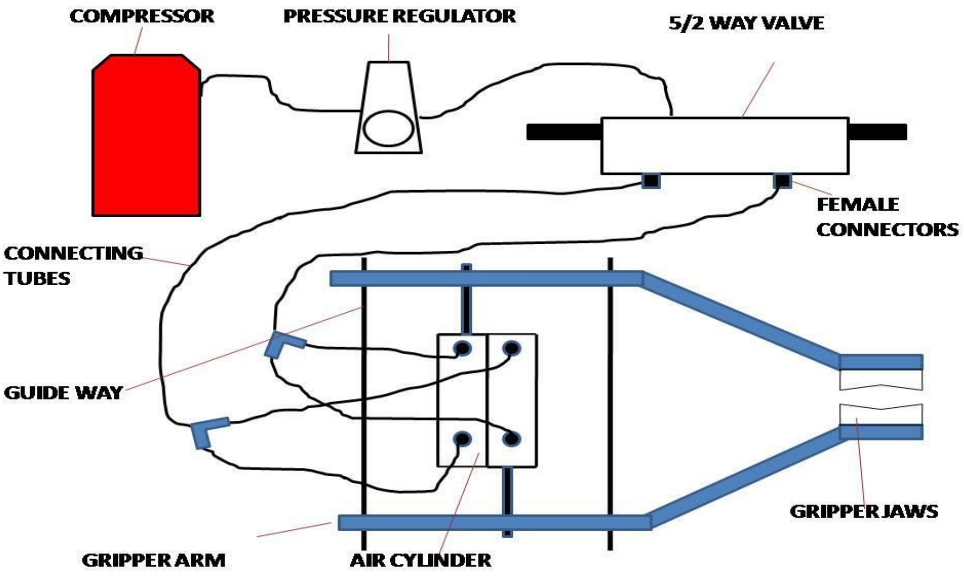


Fig.4 circuit connection of a pneumatic gripper

2. Design of pneumatic gripper developed in pro-e wildfire 5.0

- Used commands:
  - Line,
  - Circle,
  - Fillet/chamfer,
  - Trim/modify,
  - Extrude/remove,
  - Revolve. Etc….

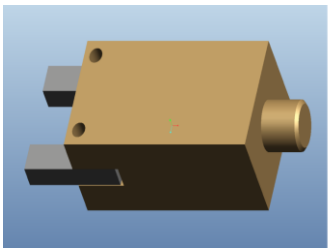


Fig.5 Pneumatic gripper developed in pro-e wildfire 5.0

3. Analysis of pneumatic gripper

- Used steps:
  - Preferences, (here we will give material properties and method of analysis)
  - Pre processor, (here we will apply loads by fixing the model)
  - Post processor (here the total results are viewed)

- Gripper design imported from pro-e to ansys

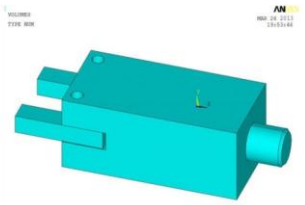


Fig.6 imported pneumatic gripper model in ansys

- Meshed design in ansys Meshed design in ansys

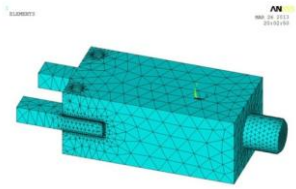


Fig.6 meshed model in ansys

4. Results & discussion

- Analysis of nodal points on gripper jaws in ansys

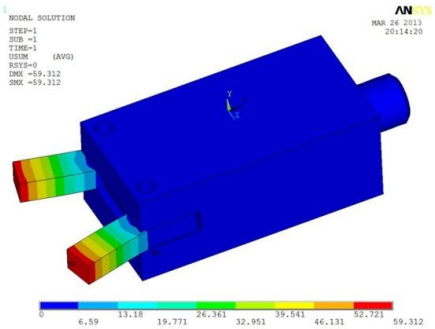


Fig.7 Deformed shape

Maximum absolute values

NODE	87	838	88	69
VALUE	12.741	1.7639	58.175	59.312

- Analysis OF STRESS INTENSITY IN ANSYS

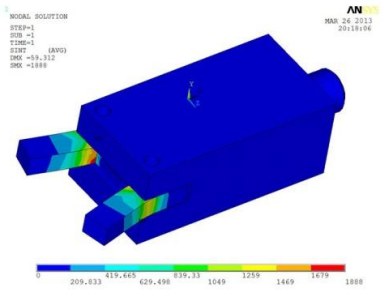


Fig.8 Stress intensity

Minimum values

NODE	3819	767	1027	1	1.0
VALUE	-76.167	-325.64	-1412.7	0.0000	0.000

Maximum values

NODE	3570	630	4232	3784	3570
VALUE	1732.0	442.01	95.273	1829.1	1678.8

- Analysis of von-mises forces in ansys

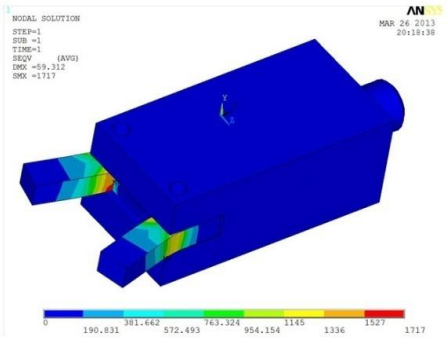


Fig.9 von-mises forces values

Minimum values

NODE	3819	767	1027	1	1
VALUE	-76.167	-325.64	-1412.7	0.0000	0.0000

Maximum values

NODE	3570	630	4232	3784	3570
VALUE	1732.0	442.01	95.273	1829.1	1678.8

VI. CONCLUSION

From the model we have found out that the pneumatic gripper has many advantages and is one of the modern techniques in the world of robotics which makes pick and drop work easier and much faster than the conventional techniques.

Highly dynamic operation and high acceleration possible. Intermediate positions can be set easily by regulating pressure. Easy to handle thin sheets and other low dimension materials which require intelligent handling. Low cost The Pneumatic grippers offer the most attractive features and are a common choice and this explanation can be inferred from the work carried out in the project. The gripper's arms were made of steel which allowed the gripper to be lightweight, yet durable for machine loading of metal parts. Such Pneumatic grippers are generally cost-effective because air hoses, valves, and other pneumatic devices are easy to maintain. Replaceable finger inserts for the gripper fingers can be manufactured from a variety of materials in future to ensure gentle part handling and a firm grip. Different types of gripping surfaces, gripping materials and different dimensions of gripping arm can be made to test the gripping force of the pneumatic robotic gripper.

REFERENCES

[1]. http://www.io.com/~hcexres/textbook/class_ex.html
[2]. Besel, Michael N. "Automation." Microsoft® Student 2007 [DVD].
[3]. Microsoft ® Encarta ® 2007. © 1993-2006 Microsoft Corporation. All rights reserved.
[4]. Industrial Robotics, Technology, Programming and Applications, Authors-Mikell P.Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G. Odrey.
[5]. A Sensor-Based Robotic Gripper for Limp material Handling by Ramesh Kolluru, Al Steward, Micheal J. Sonnier and Kimon P. Valavanis , Robotics and Automation Laboratory(RAL), Apparel CIM Centre and CACS, University of Southwesten Louisiana.
[6]. A Robust Sliding mode Control for Pneumatic Servo Systems by Junbo Song and Yoshihisa Ishida, Department of Electronics and Communication, Faculty of Science and Technology, Meiji University.
[7]. Mechatronic systems:Automotive applications and modern design methodologies by Werner Dieterle, Robert Bosch GmbH, Automotive Electronics, Driver Assistance Systems, Leonberg, Germany.
[8]. Accurate Position Control of a Pneumatic Actuator Using On/Off Solenoid Valves by Robert B. van Varseveld and Gary M. Bone.
[9]. Accurate Position Control of a Pneumatic Actuator by Jiing-Yih Lai, Graduate Associate, Chia-Hsiang Menq, Assistant Professor mem ASME and Rajendra Singh, Professor Mem. ASME Fluid Power Laboratory, Department of Mechanical Engineering, The Ohio State University, Columbus, Ohio
[10]. Design And Control Of A Robotic Leg With Braided Pneumatic Actuators By Robb William
[11]. Pneumatic Controls , Author- Joji P.
[12]. A Force-Controlled Pneumatic Actuator D. Ben-Dov and S. E. Salcudean
[13]. A High Performance Pneumatic Force Actuator System: Part I—Nonlinear Mathematical Model By Edmond Richer Yildirim Hurmuzlu Southern Methodist University, School Of Engineering And Applied Science, Mechanical Engineering Department, Dallas, Tx 75275
[14]. Manual Page, Janatics India Ltd.,DS2 Compact Valve.
[15]. Robotic Gripper Sizing: The Science, Technology and LoreBy: Ted Zajac, Jr.

Design, Modeling and Analysis of Rotary Air-Lock Valve

Shaik Nagulmeera[1], M. Anilkumar[2]

[1]PG Student, Department of Mechanical Engineering, Nimra college of Engineering and Technology.
[2]Assistant Professor, Department of Mechanical Engineering, Nimra college of Engineering and Technology, jupudi, Vijayawada, AP, INDIA

ABSTRACT

The Rotary Air-locks provide reliable service in high pressure, high temperature and other severe service conditions. The valves can be used in various industries such as food, plastics, chemical, asphalt, mining, baking, cement and paint. The main function of a Rotary Air- lock Valve is to regulate the flow of material from one chamber to another while maintaining a good airlock condition. The material or product being handled is usually dry free flowing powder, dust or granules.

Rotary Air-lock Valves are used at the bottom of Bins, Cyclones, Dust Collectors or Feed Hoppers to discharge materials at a controlled rate or act as an Airlock. They are also used to introduce materials into positive or negative conveying systems. A Rotary Feeder / Airlock Valve consists of a rotor which turns at a given RPM in close clearance to its casing thus maintaining a uniform rate of material flow and provides a seal.

In operation, a motor and drive chain turn the rotor shaft, spinning the rotor inside the housing and head plates. As the blades rotates a fixed volume of material passes through the material inlet to the spaces between adjacent blades (called rotor pockets) and is carried in the pockets toward the material outlet.

As per Bevcon provide drawings of Rotary airlock valve are designed and drafted in year 1995`1996 manually on a drawing board. 3D modeling of Rotary airlock valve is done in Pro-e. Theoretical calculations are performed for selecting bearing diameter and deflection of shaft as per beam analysis find out by using Ansys.

The analysis of shaft and rotor assembly done in Ansys to find the deflection values from these values Factor of safety of selected diameter is calculated. In brief 3D models developed in pro-e & analyzed reports have been submitted to Bevcon for their consideration in their designs.

Keywords: *Air locks, Ansys, Bevcon, Pro-E, Rotary feeder.*

I. INTRODUCTION

The main function of a Rotary Air- lock Valve is to regulate the flow of material from one chamber to another while maintaining a good airlock condition. The material or product being handled is usually dry free flowing powder, dust or granules. In operation, a motor and drive chain turn the rotor shaft, spinning the rotor inside the housing and head plates. As the blades rotates a fixed volume of material passes through the material inlet to the spaces between adjacent blades (called rotor pockets) and is carried in the pockets toward the material outlet.

Rotary Air-lock Valves are used at the bottom of Bins, Cyclones, Dust Collectors or Feed Hoppers to discharge materials at a controlled rate or act as an Airlock. They are also used to introduce materials into positive or negative conveying systems. A Rotary Feeder / Airlock Valve consists of a rotor which turns at a given RPM in close clearance to it's casing thus maintaining a uniform rate of material flow and provides a seal. The Rotary Air-locks provide reliable service in high pressure, high temperature and other severe service conditions. The valves can be used in various industries such as food, plastics, chemical, asphalt, mining, baking, cement and paint.

Rotary Air- Locks are usually used to accomplish 3 basic tasks:
a) to feed material from bins or hoppers.
b) To deliver fines from the collector while sealing against air loss.
c) And to feed material to pneumatic conveying line against pressure.

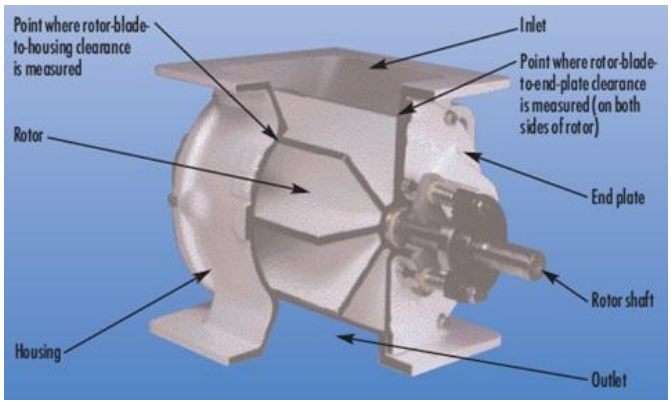


Fig.1 Rotary Air-lock valve cut way view

II. ROTARY

Refer to this figure and locate the vanes and pockets. The word 'rotary' refers to the fact that during operation of a rotary airlock, the vanes turn or rotate. As they turn, the pockets, which are formed between the vanes, become rotating pockets. The material being handled enters the pockets at the top, through the Inlet port, travels around in a rotating motion, and exits at the bottom, or through the Outlet port. As the vanes and pockets continue to turn, material continues to be moved from top to bottom, or from Inlet port to Outlet port, in a rotating motion.

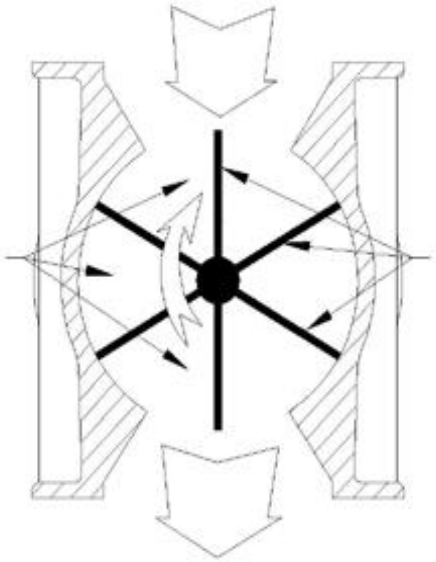


Fig.2 Rotary

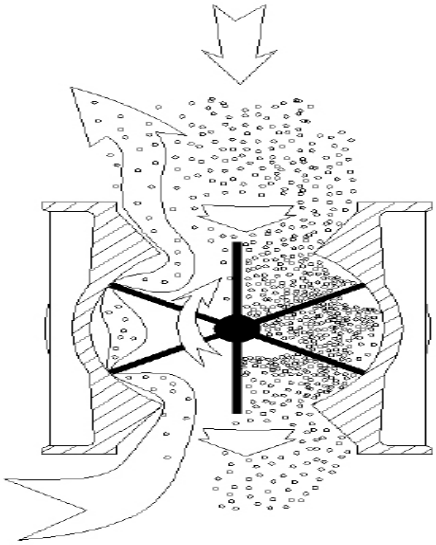


Fig.3 Airlock

III. AIRLOCK

Refer to above figure, the word 'airlock' means that this device is to act as a seal, or lock to the air, between the Inlet and Outlet ports, while moving material in a continuous rotating motion through its pockets. Material travels downward from Inlet port to Outlet port, but airflow is restricted. To provide a reference in discussing airflow through the rotary airlock, we have notated a 10 PSI air pressure on the Outlet port side. The air pressure, in this example, is trying to push airflow up through the rotary airlock

IV. OPERATING PRINCIPLE

The material is fed into rotor pockets (A gap between two vanes) from hopper or bin. Due to rotation of shaft vanes also rotates. Due to rotation of vanes the, material in the rotor pockets will be transferred from inlet of airlock valve to its outlet. From outlet it will go to the pneumatic conveying system.

1. Types of Rotary Air-lock valves:

- Drop Thru Rotary Airlock
- Side Entry Rotary Airlock
- Blow Thru Rotary Airlock
- Easy Clean Rotary Airlock
- The Removable Gland Follower

2. Features of Rotary Airlock valve

- Outboard bearings
- Replaceable packing rings
- Round or square flange available
- Larger shaft diameters than competition
- Cast iron, 304SS, 316SS, 316SS Ni-Hard

3. Benefits of Rotary Airlock Valve:

- No product contamination higher operating temperatures
- Easy packing change without rotor removal
- Select from multiple sizes to fit the application
- Reduces deflection
- Assures maximum torque delivery

4. Design of shaft

Data for calculations

- Weight of Air lock valve = 600kg
- Arm Length = 240mm
- Speed = 27 rpm
- Shear Force = 650 kg/cm2
- Bending Force = 800 kg/cm2
- Combined shock & fatigue factors for bending (k_m) = 2
- Combined shock & fatigue factors for torsion (K_t) = 2
- Power = 2 H.P
- Bearing Length = 140cm

Summary for Theoretical Calculations

The deflection obtained theoretically is 0.0135mm. This deflection will compared with deflection obtained in Ansys. We can ensure a safety by seeing Factor of safety. For Rotary Airlock valves the factor of safety should be in range of 1 to 2. For us the factor of safety obtained is 1.45. So these values are safe for designing airlock valve.

v. ASSEMBLY MODEL OF ROTARY AIRLOCK VALVE

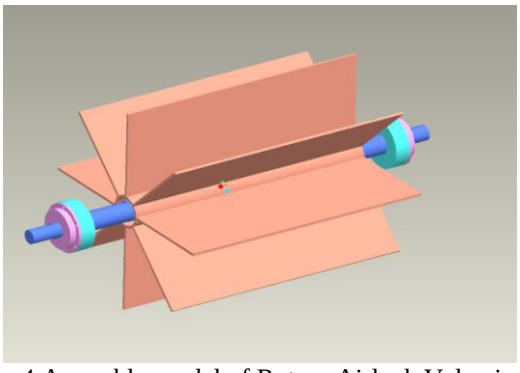
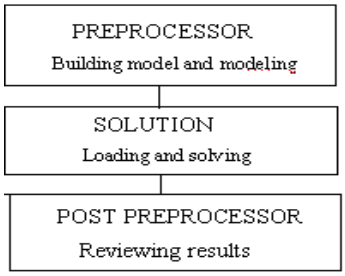


Fig.4 Assembly model of Rotary Airlock Valve in Pro-E

VI. ANALYSIS OF ROTARY AIRLOCK VALVE IN ANSYS

Basic steps in ansys (Finite Element Software):



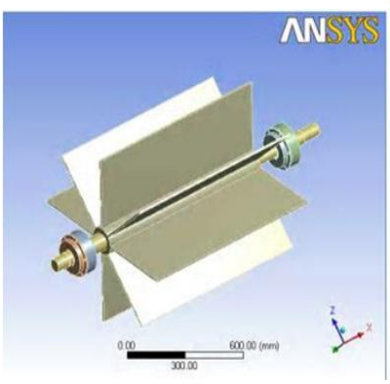


Fig.5 Imported model

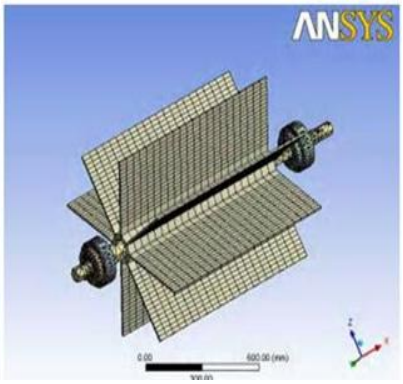


Fig.6 Meshed model

VII. RESULTS & DISCUSSSION

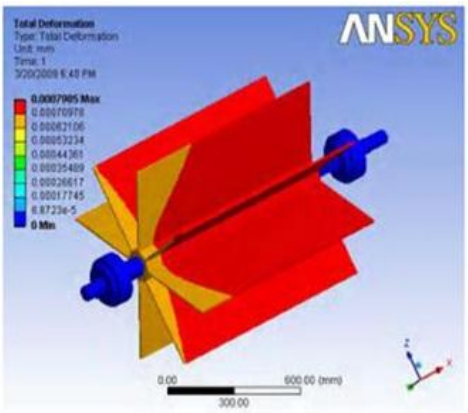


Fig.7 Total deformation

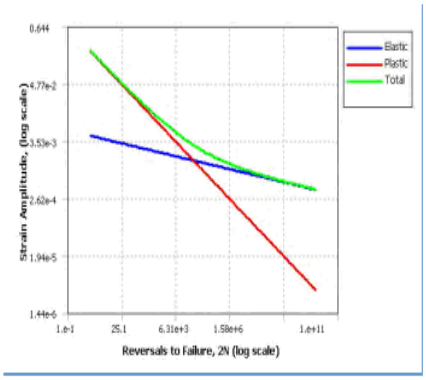


Fig.8 Results summary

Let us see the results in 2D and 3D. We have taken beam as element type and analysis is performed on it. We got maximum deflection of 0.04194mm which is very less compared to safe limit. The following figure shows the nodal solution.

Now we can see the stresses in shaft. Maximum stress developed in shaft is 22.9 N/mm^2 which is far less than the yield strength of the material, which is 45 N/mm^2. So that shaft will not fail under these conditions.

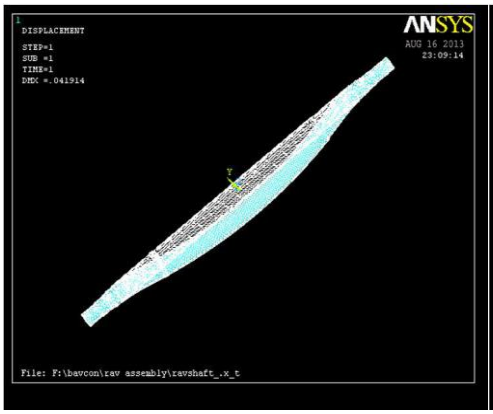


Fig.9 Maximum stress

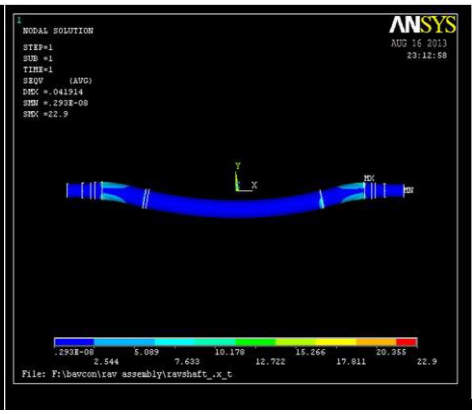


Fig.10 yield strength

VIII. CONCLUSION

As per Bevcon provide drawings of Rotary airlock valve are designed and drafted in year 1995`1996 manually on a drawing board. 3D modeling of Rotary airlock valve is done in Pro-e. Theoretical calculations are performed for selecting bearing diameter

- As per calculations selected diameter is 60 mm
- Bearing selected for Rotary airlock valve is deep groove ball bearing.
- As per drawings shaft diameter is 90mm. Based on calculations the diameter obtained is 60mm
- Deflection of shaft as per beam analysis 0.0134 mm
- As per analysis of shaft and rotor assembly done in Ansys, deflection values of shaft and rotor assembly are 0.041 and 0.0007 mm respectively.
- Factor of safety of selected diameter is 1.45
- 3D models developed in pro-e & analyzed reports have been submitted to Bevcon for their consideration in their designs

REFERENCES

[1]. PERRY, r.h., AND d.w.Green, "perrys chemical engineers" handbook , "7th ed.,
[2]. Fayed , M.E., and L.Otten (eds,) "Handbook of Power Science Technology",
[3]. "Ball Bearing " 3rd edition R.K.Allan`
[4]. "Theory and Problem of Machine Design Hall ", Holowenko Laughlin Shams series
[5]. "Introduction to Machine Design" V.B. Bhandari
[6]. "Material Selection in Mechanical Design".
[7]. "Fundamentals of Machine Component Design",Robert C. Junivina .Kurt M.Marshek
[8]. Scham Tickoo "Pro-Engineer"
[9]. J.N.Reddy "An Introduction to Finite Element Method" , 3rd edition.

WEBSITES:

[10]. www.kice.com
[11]. www.macsairlocks.com
[12]. www.youngindustries.com
[13]. www.carolinaconveyings.com
[14]. www.dmn-inc.com
[15]. www.airex-industries.com
[16]. www.rotolok.com
[17]. www.wikipedia.com

Optimal Design of a Clutch Plate using Ansys

V Mani Kiran Tipirineni[1], P. Punna Rao[2]

[1]PG Student, Department of Mechanical Engineering, Nimra college of Engineering and Technology.
[2]Assistant Professor, Department of Mechanical Engineering, Nimra college of Engineering and Technology, Vijayawada, AP, INDIA

ABSTRACT

The clutch is one of the main components in automobiles. The engine power transmitted to the system through the clutch. The failure of such a critical component during service can stall the whole application. The Finite Element Analysis providing a means for non-destructive analysis, which is used to analyze the clutch driven plate. The results from the FEA are accurate and hence being used worldwide for design and research engineers.

The driven plate used in Leyland Viking Vehicle is analyzed in this work. The driven main plate failed normally during its operation due to cyclic loading. This project explains the structural design analysis of the clutch plate and find out the failure region by doing static analysis in ANSYS software.

The 3D model of clutch plate was drafted using Solid works software and analysis of the plate was done for static loading condition. This project finds the maximum stress in failure region during operation. This project also suggests three design modifications to the company to improve the lifetime of the clutch plate.

Keywords: *Ansys, FEA, Single Plate Clutch, Solid works*

I. INTRODUCTION

The power developed inside the engine cylinder is ultimately aimed to turn the wheels so that the motor vehicle can move on the road. The reciprocating motion of the piston turns a crankshaft rotating the flywheel through the connecting rod. The circular motion of the crankshaft is now to be transmitted to the rear wheels. It is transmitted through the clutch, gearbox, universal joints, propeller shaft or drive shaft, differential and axles extending to the wheels. The application of engine power to the driving wheels through all these parts is called power transmission.

The power transmission system is usually the same on all modern passenger cars and trucks, but its arrangement may vary according to the method of drive and type of the transmission units. The power transmission of an automobile. The motion of the crankshaft is transmitted through the clutch to the gear box or transmission, which consists of a set of gears to change the speed. From gear box, the motion is transmitted to the propeller shaft through the universal joint and then to the differential through another universal joint. The differential provides the relative motion to the two rear wheels while the vehicle is taking a turn. Thus the power developed in the engine is transmitted to the rear wheels through a system of transmission. Clutch is a device used in the transmission system of a motor vehicle to engage and disengage the engine to the transmission. This device is used to transmit the power on user will.

II. Function of a clutch

Clutch is a device which is used to engage or disengage the power from the prime mover to the driven on users will. In automobiles clutch is located between the engine and the transmission. When the clutch is disengaged, the power is not transmitted to the rear wheel and the vehicle stops while the engine is still running. The clutch is disengaged when starting the engine, shifting the gears stopping the vehicle and during idle time. The clutch is engaged only when the vehicle is to move and is kept engaged when the vehicle is moving. When properly operates it prevents jerky motion of the vehicle. The main part of single plate clutch is shown in the fig 1.

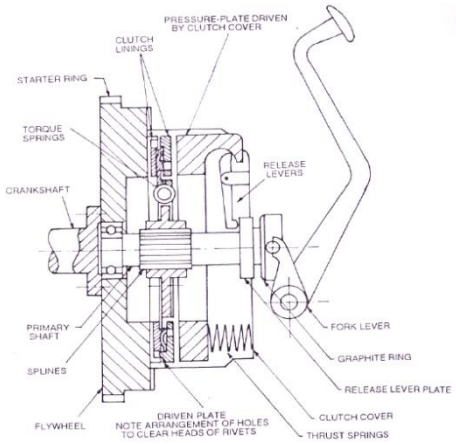


Fig.1 Main Parts of Single Plate Clutch

III. OPERATION OF THE CLUTCH

When the clutch pedal is depressed, through pedal movement, the clutch release bearing presses on the clutch release lever plate, which being connected to the clutch release levers, forces these levers forward. This causes the Pressure Plate to compress the Pressure Springs, thus allowing it to move away from the Clutch Driven Plate. This action releases the pressure on the Driven Plate and Flywheel, the flywheel is now free to turn independently, without turning the transmission. When the clutch pedal is released, reverse action takes place: the driven plate is again forced against the flywheel by the pressure plate- because of the force exerted by the pressure springs.

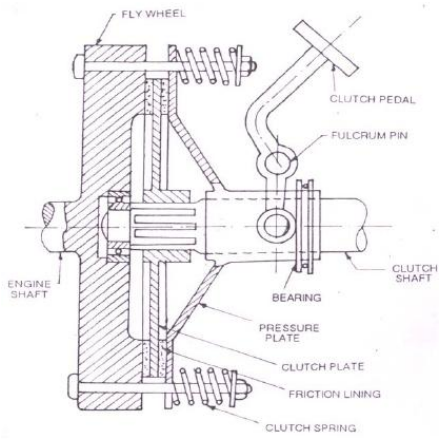


Fig.2 Single Plate Clutch

The pressure plate will keep on compressing the facings of the driven plate until the friction be created becomes equal to the resistance of the vehicle. Any further increase in pressure will cause the clutch plate and the transmission shaft to turn along with the flywheel; thus achieving vehicle movement.

IV. DRIVEN PLATE

Every time the clutch is engaged, the entire power delivered by the engine is transmitted from the flywheel to the transmission, through the splines in the hub of the clutch driven plate. When new, the clearance between the splines of the clutch plate hub and transmission shaft is kept as small as possible but at the same time allowing the clutch plate free movement along the transmission shaft.

If, at the time of transmitting the engine torque, the driving face of the driven plate hub spline is in contact with the transmission shaft spline face, the transfer of energy will be like a smooth push-there will be no shock or jolt. The driven plate under analysis is a fan type clutch. The shape of the clutch is like a fan . The conventional spring centered driven plate is shown in the fig 3.

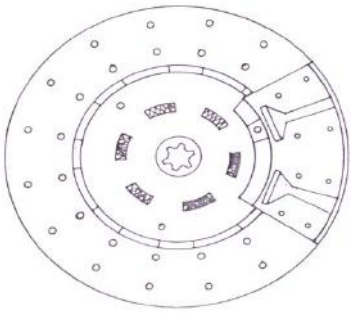


Fig.3 Driven Plate

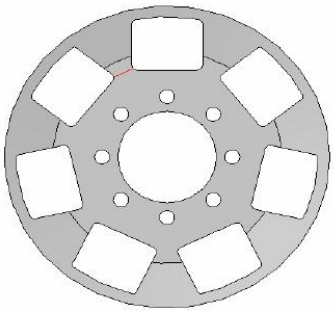


Fig.4 Crack Formation Area

V. CRACK FORMATION AREAS

Crack is formed on the side plate of the clutch. Side plate consist of various slots in which the damper springs are engaged. And these slots are called as windows. These damper springs is used to absorb the torque during the engagement of the clutch. The crack is formed between these two windows. The crack is shown as red mark in the fig 4.

VI. MODELING AND ANALYSIS OF ACTUAL DRIVEN PLATE OF A CLUTCH

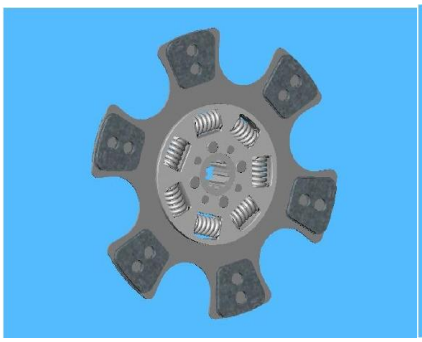


Fig.5 Assembled View of the Side Plate

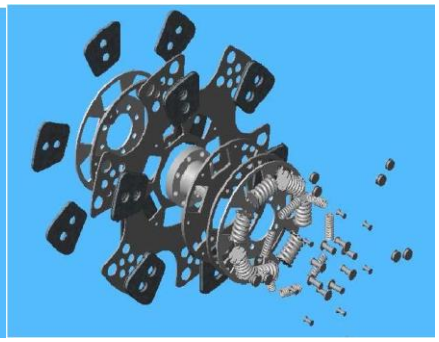


Fig.6 Exploded View

The exploded view can be created by using following commands. Insert -Exploded view- new-direction to explode- pick entities to be exploded the exploded view is shown in the fig 6.

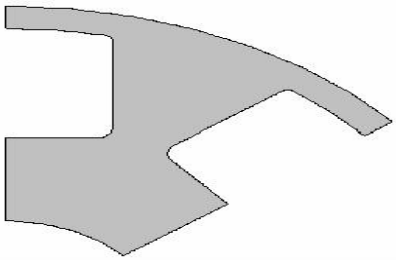


Fig.7 Part under Analysis

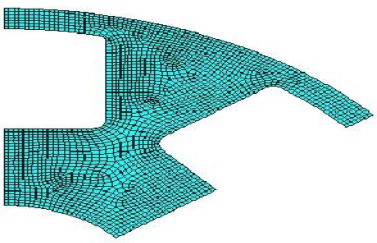


Fig.8 Meshed Model

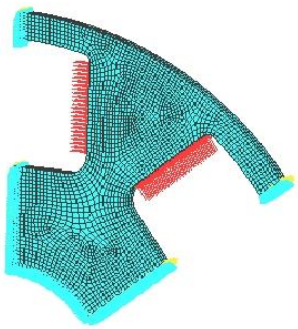


Fig.9 Boundary and Load Condition

VII. RESULTS FOR ACTUAL DRIVEN PLATE

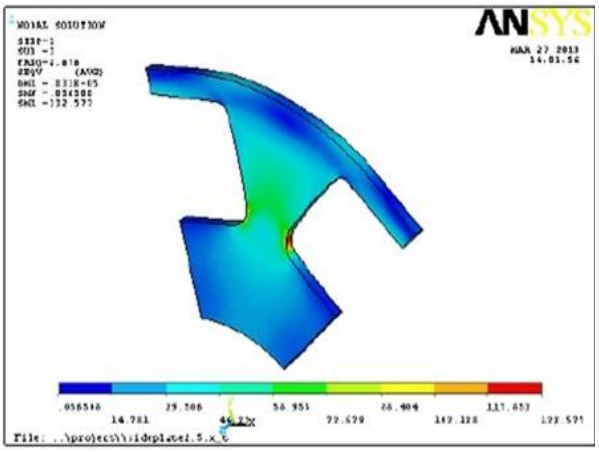


Fig.10 Stress Intensity

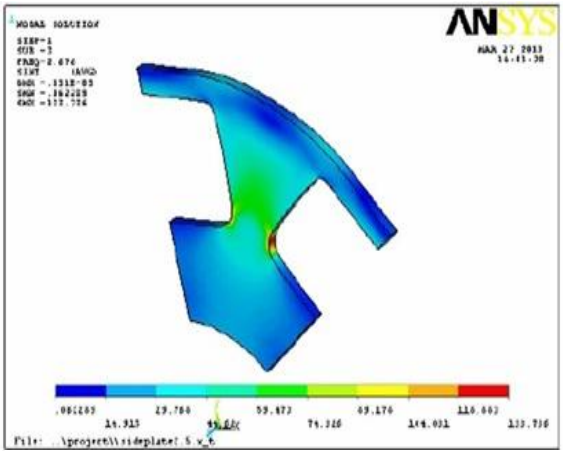
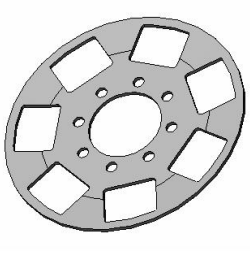
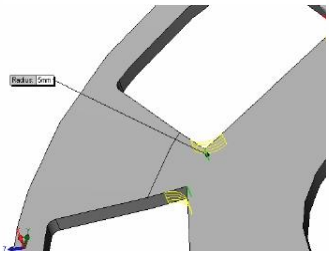


Fig.11 Von Mises Stress

VIII. MODELING AND ANALYSIS OF MODIFIED DRIVEN PLATE OF A CLUTCH





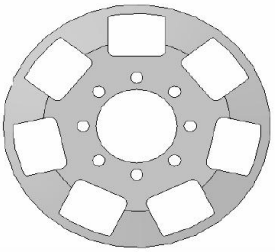


Fig.12 Plate of Thickness 3mm - **Fig.13** Plate Of fillet radius 5mm - **Fig.14** Plate Of thickness 3mm and radius 5mm

IX. RESULTS FOR MODIFIED DRIVEN PLATE

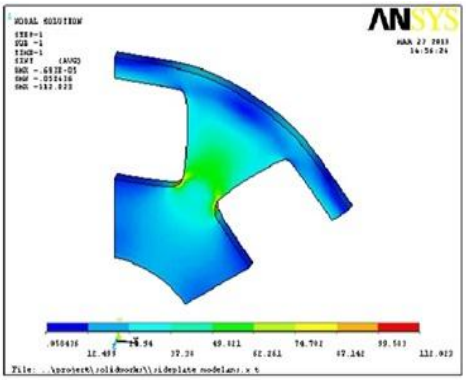


Fig.15 Plate of Thickness 3mm

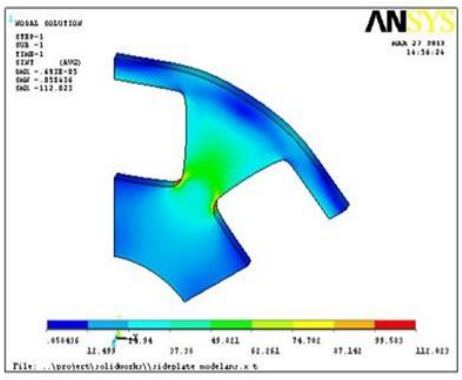


Fig.16 Plate Of fillet radius 5mm

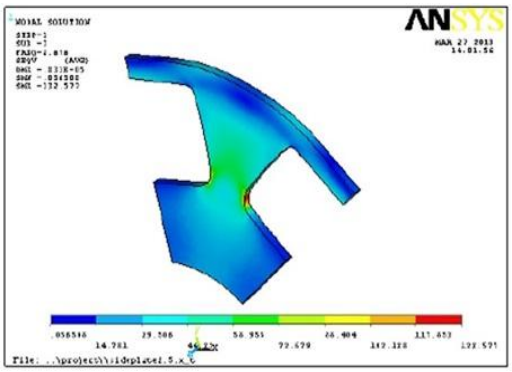


Fig.17 Plate Of thickness 3mm and radius 5mm

X. CONCLUSION

As from the analysis result of the actual side plate the maximum value of stress is very near to the theoretical endurance limit. Due to which the crack is formed on the side plate during the earlier period of the testing. In order to increase the life of the side plate of the driven plate. Some of the modifications are done on the side plate to reduce the maximum stress. Primarily the thickness of the plate is increased and this modification gives maximum stress lesser than the maximum stress of the actual side plate. Factor of safety is increased to 1.23. Alternative modification of the side plate is done by increasing the fillet radius. The maximum stress obtained by this modification is lesser when compared to the previous modification. Factor of safety is increased to 1.52.

In order to reduce the maximum stress further, both the above said modifications are combined. The maximum stress is reduced further. Factor of safety is increased to 1.7. This design has highest factor of safety than the other modifications. This ultimately increases the life of the driven plate. This design is also tested practically in the lab and it is confirmed that the life of the driven plate is increased.

The present design analysis was done to find the failure region and reasons for failure only by onsidering the structural analysis. In future this project can be extended to thermal analysis by considering frictional effects during the operation.

REFERENCES

[1]. R.B.GUPTA (2005) 'Automobile Engineering' , Sathya Prakasan Publishers.
[2]. IBRAHIM ZEID (1998). 'CAD/CAM Theory and practice' , Tata Mcgraw Hill.
[3]. C.S. KRISHNAMOORTHY (1994) 'Finite Element Analysis Theory and Programming' , Tata Mcgraw Hill.
[4]. Design Data(2000), PSG College of Technology , Coimbatore, DPV printers & Publisher
[5]. ANSYS online documentation Journal references:
[6]. Vibration Analysis of the Friction clutch Disc Using Finite Element Method Advances in Mechanical Engineering and its Applications (AMEA) 86 Vol. 1, No. 4, 2012, ISSN 2167-6380
[7]. Finite Element Analysis for Grooved Dry Friction Clutch Advances in Mechanical Engineering and its Applications (AMEA) 121 Vol. 2, No. 1, 2012, ISSN 2167-6380
[8]. 8. Structure Analysis of Cast Iron for Dry Clutch of Amphibious Vehicle International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 5- May 2013

Competitive Strategy of Enterprises in Networks with Applications: Clouds Computing, Service Orientation and Web Services

[1,] Chau Sen Shia, [2,] Ivanir Costa, [3,] Mario Mollo Neto

[1,] *Doutor, Engenharia de Produção, Departamento de Pós-Graduação de Engenharia de Produção, Universidade Paulista UNIP. São Paulo, SP – Brasil,*

[2,] *Doutor, Engenharia de Produção, Departamento de Pós-Graduação de Engenharia de Produção, Universidade Paulista UNIP. São Paulo, SP – Brasil,*

[3,] *Doutor, Engenharia de Produção, Departamento de Pós-Graduação de Engenharia de Produção, Universidade Paulista UNIP. São Paulo, SP – Brasil,*

ABSTRACT

Most Educational Universities encounter difficulties in developing a work of integration when need to do planning: allocation of classes, distribution of rooms, allocation of classes and establish better communication between the coordinators of other units belonging to the same institution (geographically distributed). According to Veras (2010) as a way to react to the increased competition, many companies have sought to use a more flexible organizational format. Currently, the use of business networking alliances has become an option in the search of this flexibiildade. The networks that interconnect, organizations offer support for processes, in response to the new times of this competitiveness. It may be noted that the inter-organizational networks supported by information technology (it), allow organizations to act together as a great value system. According to Fusco and Sacomano (2009), alliances may develop in any supply chain, provided the environment in which they occur, operations tasks, and processes to be developed, the qualities required, and available and the objectives to be developed. The performance of each part is what will make the difference in getting the results of the companies involved in the business. In order to better meet the studies related to behavioral analysis of alliances in enterprise networks with the use of technologies of cloud computing (cloud computing), this project applies the structure of how virtualization assessment tool for analysis of relationships between companies and the strategic alignment in organizations. In this context, this project intends to propose an architecture of integration of technology cloud computing with SOA (Service Oriented Architecture – service-oriented architecture) using web services (WEB Services) to assist in the execution of strategic business processes within the organizations aimed at universities that have multiple geographically distributed units.

Key-Words: *performance, virtualization, web services, cloud computing, service-oriented architecture.*

I. INTRODUTION

Reality increasingly dynamic and volatile and that configures the competitive assumptions and paradigms of competitiveness, have brought the need to speed up processes, business and organizations, therefore internationalize should be the presence of thought competitive and the strategic alignment of that reality (FUSCO and SACOMANO, 2009). Conform Tonini, Carvalho and Spinola (2009), for competitive advantage, companies must continually update themselves on technology, get maturity in processes and eliminating operational inefficiencies. This requires an engagement ads people, processes and the Organization as a whole.

Currently the companies are organizing network format, and business processes among the organizations increasingly use the applications that process and provide information for the operation of this new arrangement. The new organization, is a combination of various organizations, composed of interconnected cells with several access points provided by infra-structure information technology (IT), while the central element of processing and storage of information and data in the cloud is the *DATACENTER* (VERAS, 2009).

Aiming to establish a model of integration of alliances in corporate networks and the application of technologies *cloud computing*, SOA and *web services* to assist in strategic business processes of organizations into networks of relationships, the proposed project features the use of these technologies. Checks the possibility

of alliances and resource to sharing, to enter into multilateral agreements, tthe organizational relationships, interpersonal and inter-organizational.

The SOA is an architectural model agnostic to any technology platform and causes a company to have the freedom to get constantly the strategic objectives associated with service-oriented computing, taking advantage of the technology. The *web services* platform is defined by several industry standards supported by all communities, suppliers can be distributed and provide a *framework* for communication based on physically decoupled service contracts. To enable the business processes of a company the implementation of the strategy depends on your infra-structure information technology (IT). The infrastructure is the part of YOU that supports applications that support business processes is the Foundation of the Organization's operational model based on information. Can also be seen as the set of shared services, available for your entire organization, because it has the role of enabling the Organization to function and grow without large interruptions. A *cloud computing* is a set of virtual resources easily usable and accessible (*hardware*, *software*, and services development platform), which can be dynamically reconfigured to fit a workload (*Workload*) variable, allowing for optimization of the use of resources such as virtualization, application architectures, service-oriented infrastructure and technologies based on the Internet (VERAS, 2009).

To developer an architectural model will use the implementation on *web services*, the SOA, and the *cloud computing* for the strategic simulation on intra-organizational networks in the departments of an educational institution of higher education to planning and formation of new courses and adapting existing courses. The proposal established in this project is related to an IES (Higher Education Institution), aiming at the studies in corporate networks, production engineering and analysis of application of new technologies used for strategic planning within companies.

II. THEORETICAL FRAMEWORK

This section describes the main aspects and justifications for the construction of the system proposed in this paper and related to: cloud computing, service-oriented architecture, *web services* and University Educational Center as companies in networks.

2.1. Application of alliances in enterprise networks

The role of the Alliance will make the difference in getting the results of the companies involved in the business. Thus it is important to create solid alliances, but well developed, sufficiently flexible to include changes, as the market environment and corporate objectives change and the relationship evolve. The rings can be threatened only if the expected benefits of the relationship growing ever smaller, or if the behavior of any of the parties is considered opportunistic, (FUSCO and SACOMANO, 2009).

In this context, the relationship and the types of relationships should establish the density, the centralization and fragmentation of the network, establishing measures of position of the actors in the network. Figure 1 shows a model of communication with firms in networks, where using contracts for systems of cooperation and alliance relationships between organizations.

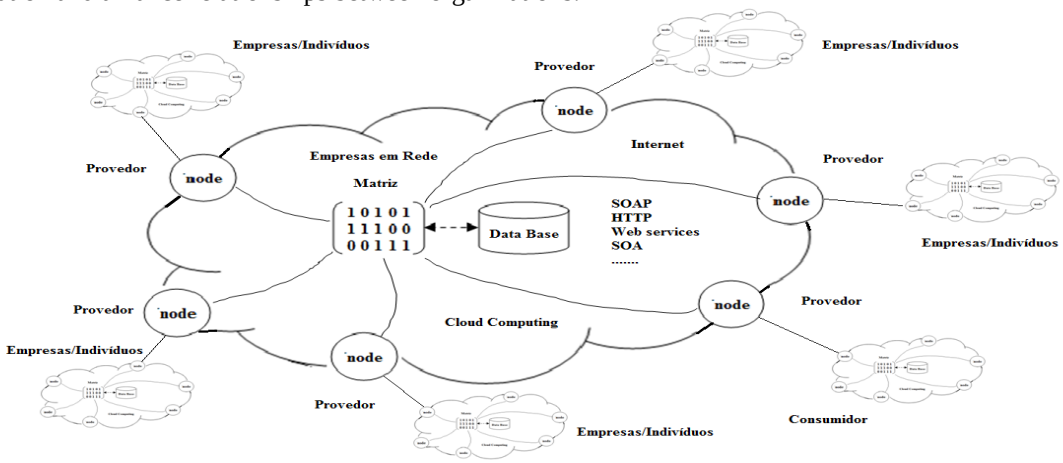


Figure 1-business networks, Contracts, Departments, Teams and Individuals, author.

The model presented in Figure 1 (proposal of this work) represents a set of *nodes* (nodes) or cloud computing providers that interconnect dynamically through a structure of type array. This structure is the mechanism responsible for locating services between providers and its main components are the array (static structure), in the tree structure (structure dynamic), graphs (search techniques and locations) and database (or knowledge base) where are located the services described using the architecture SOA (*Service Oriented*

Architecture), *web services*technologies, protocols, HTTP (*Hypertext Transfer Protocol*), SOAP (*Simple Object Access Protocol*) and features of the *internet*itself. Subnets are comprised of companies or individuals that can be of type consumer or supplier of services and are responsible for the exchange of communication within the network (network Companies).

2.2 Practice of service design principles

A design paradigm, in the context of business automation is considered the approach that governs the design of logic, which consists of set of rules (or principles) complementary that define collectively the broad approach represented by paradigm. The fundamental unit of service-oriented logic is the *service* and by itself represents a distinct design paradigm. Each service gets its own distinct functional context and has a set of capabilities related to this context via public service contract (ERL, 2009).

In this context, the practice and the fundamentals of service contracts allow for greater interoperability, alignment of business and technology domain, greater organizational agility, greater diversification of suppliers, lower workload, low service coupling, service abstraction, and reuse of service and reduced amount of application-specific logic.

2.3. Application of integration of cloud computing and networking companies

Cloud computing is a set of virtual resources easily usable and accessible *hardware* (physical), *software* (logical), and services development platform. Its resources can be dynamically reconfigured to fit a workload (*Workload*) variable, allowing the optimization of the use of resources and replace it assets. These features and services are developed using new virtualization technologies, which are: application architectures and service-oriented infrastructure and technologies based on the internet as a means to reduce the resource usage costs of hardware and software you used for processing, storage and networking, (ERL, 2009). For the purposes of integration with corporate networks are analyzed the fundamentals the inter-organizational network, intra-organizational and inter-personal.

Inter-and intra-organization networks are special cases of interpersonal networks. In business, relationships are conducted between individuals (interpersonal network), because they are the ones who start an Alliance or contact between these companies. The inter-organizational network is networks based on the relationship between companies or organizations in General. Already the inter-organizational network is networks of individuals in organizations, (LAZZARINI, 2008). In this context, the use of infrastructure virtualization allows establishing flexible structures to meet the demands of business and structure dynamically strategies and corporate goals, as shown in the figures 2 (classic networking companies) and Figure 3 (proposed model networking companies).

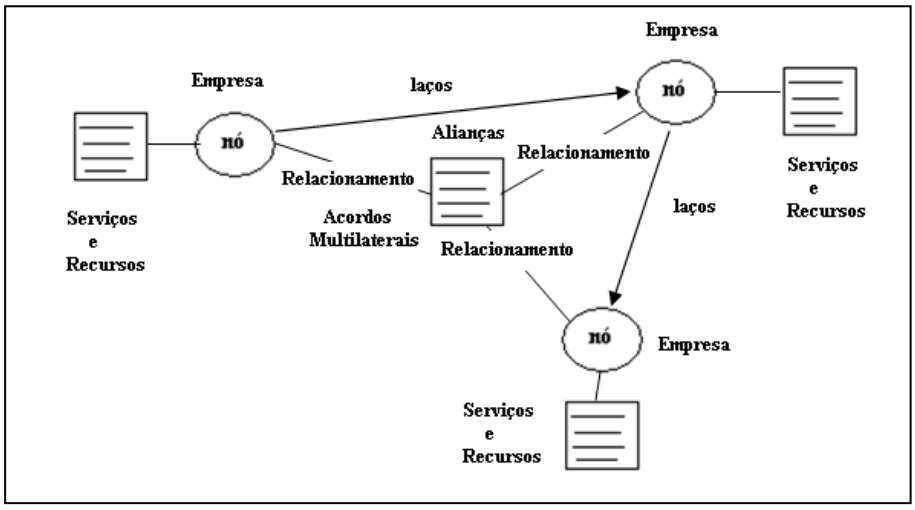


Figure 2 -Business networking and relationships between businesses, the classical model, author.

Figure 2 shows the classic model of a relationship structure of firms in networks, where the nodes are companies where each one of them describe their services and provide their resources to be shared. In the Centre of the relationship are the alliances that are established between companies and multilateral agreements in accordance with the rules and policies of relationships established between these companies that must be met. The problem observed for this type of model is the static relationship, lack of control and transaction

management services. There is no application of technological resources available in the market and many ties clusters as shown in Figure 3 below.

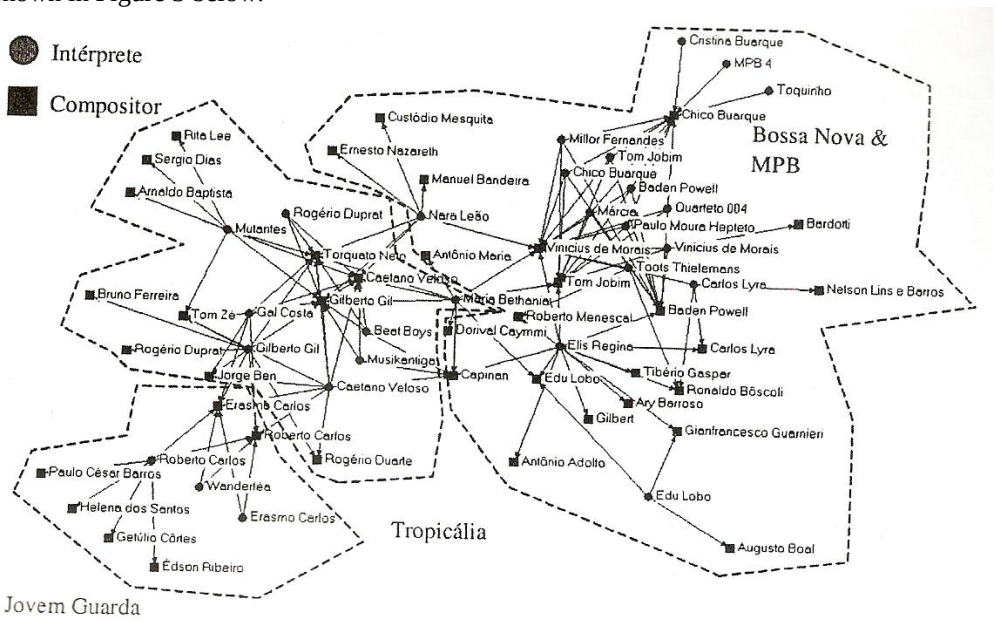


Figure 3 -Network intérptretes and composers of Brazilian music period 1958-1961. Source: Kirschbaum and Vasconcelos (2007).

The figure 3 shows a network of interpreter of composers of Brazilian music using a model of relationship and interconnection between music styles and compositions of the 1958 and 1961 season. The figure 4 shows an improvement relacinamento using the techniques of cloud computing and web service where companies, individuals or groups of individuals who can form alliances or service contracts using the resources of service orientation (SOA) technologies and communication protocols available over the internet.

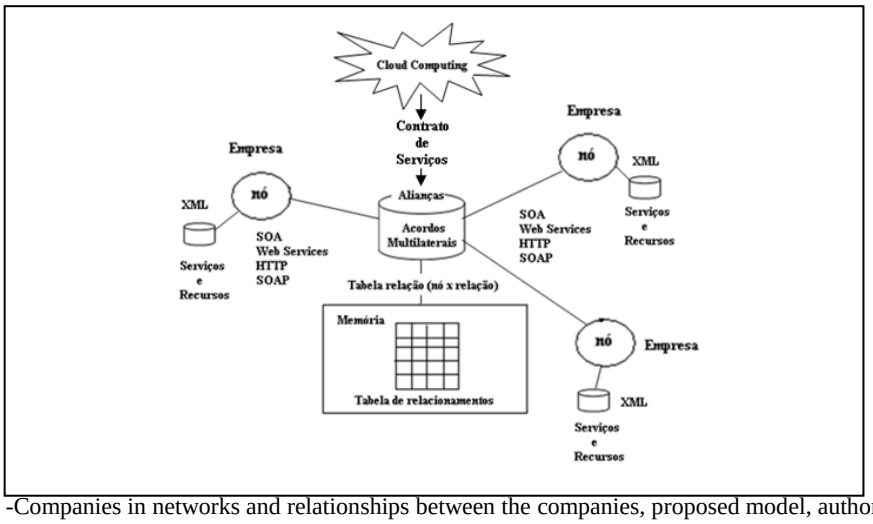


Figure 4 -Companies in networks and relationships between the companies, proposed model, author.

Figure 4 represents a proposed model for setting up companies in network with the use of web technologies, service-oriented architecture, cloud computing and communication protocols for exchanging information and messages between the enpresas. The nodes represent companies, where each one of them have their own services and resources in their own bases. At the center of this control are multilateral agreements where are established alliances and service contracts using virtualization techniques of cloud computing. The main search engine is responsible for the relationship table cotnrole and dynamic management of firms that tracks the relationship between the nodes for the exchange of information using the techniques of transaction services.

2.4. *Web services* integration with service-oriented architecture

The SOA is an architectural model agnostic to any technology platform, in this way companies can get their strategic objectives associated with service-oriented computing. In the current market, the platform of more associated with technology? , realization of SOA is the *web services*. This platform can be distributed and have the collections of standards and specifications that provide service description language, definitions from schemas, protocols of accesses to simple objects, Integration and discoveries of universal basic Profiles descriptions, message level security, transactions, cross-service and reliable message exchanges. All this are being provided by the technology of *web services* platform, (ERL, 2009).

In this context the following communication standards interfaces based on service contracts and independent implementation technologies given the loosely coupled paradigm. Coupling is the relationship established between the service contract, the logic and the resources that are encapsulated.

III. METHODOLOGY AND MATERIALS

Models will be developed and made available in cloud computing applications, for depends on of the foundations proposed in this project. In addition will be monitored and simulated in a intraorganizacional network within the IES (higher education Institution) in the undergraduate program in computer science and information system.

3.1. Scope of the experimental work

Will be built an application with service orientation structures (SOA) and development platforms (*web services* and *cloud computing*) based on the fundamentals presented according to the main authors of literature FUSCO and SACOMANO, (2009); ERL (2009); VERAS (2009 and 2010); LAZZARINI (2008); DEITEL (2005) and JORGESEN (2002).

The system will be analyzed and compared with the concepts of networking companies according to their use in cloud computing and virtualization technologies of *web services*. The application of time planning for the courses of computer science and information system is part of the proposed system and allows them to be shared among engineers using the distribution and d virtualization to cloud computing. Apply the features of intra-organizational networks according to the organizational structure of each unit who are geographically distributed that IES (Higher Education Institution).

3.2. Project architecture

Figure 5 shows the architecture of the integration *cloud computing* with companies in networks, using *web services* with SOA model, the communication protocol HTTP (*Hypertext Transfer Protocol*), the interfaces WSDL (*Web service Description Language*) and the default language XML (Extensible Markup Language).

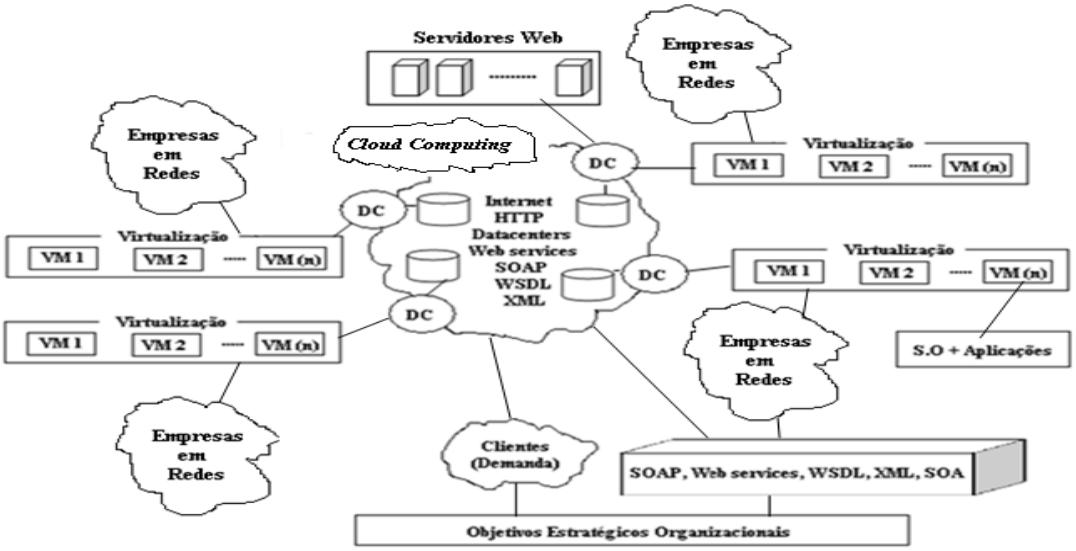


Figure 5 -Architecture integration companies in networking, cloud computing, web services and SOAP, author.

Figure 5 shows the architecture of the proposal of this work and its principal components. In the Centre is implementing ads techniques and resources available by cloud computing that are the *internet*, HTTP protocols, the *datacenters*, technologies *web services* SOAP protocols (*Web Services Object Access Protocol*), WSDL, and XML.

3.3. Details of the components

The infrastructure will be developed and the key components to extend the capabilities of communication between companies and networks enable service transactions between organizations.

In this project the main components are: the doors of communication between the structures of clouds Computing Virtualization, networking organizations, SOA service models and technologies of *web services*.

3.4. Tools used

The main tools used are: the hosting cloud computing, *web services*technologies, the SOA services models and techniques of intelligent search and dynamics of the tree and graphs.

3.5. Application environments

The environment for realization will be built on a network of educational company of type intraorganizacional. The infrastructure for the implementation of the case study should be built within a University where the departments need to be interconnected on networks of computers. Aiming at the implementation of this work is its implementation with cloud computing and the demonstration of its advantages.

3.5.1. Measure of network structure

The structure of a network can be characterized by their general structure or the way the ties are established between nodes (actors) of a network. However the assessment of the structure of this network can be accomplished through the density, centralization and fragmentation. A network is dense when several actors are connected to each other. The measure of density can be easily computed. Considering that there are no actors for certain context and ties not directional, the maximum number of links that it is possible to be established can be applied using the formula is N(N-1)/2 this occurs when all actors are connected to each other. Already the measure of density represents the number of observed network ties, dividing by the maximum number of links that is allowed for this network. However, if the actors don't have a bow to each other, the measure of density is equal to zero and if all actors were connected to each other, the density is equal to one (LAZZARINI, 2008).

A network can be coordinated by applying the concepts of network centralization. In this case the central actor joining several other actors who are not connected with other groups, this central actor then plays the role of coordinating and controlling other actors. According to Lazzarini (2008), the central actor can add to the actors don't low density plants offering guidance to perform certain task. Density and centralization indicate how the network (as a whole) is structured. Already a fragmentation are disconnected subnets where the actors don't relate to other groups of actors. A high fragmentation means that there exists a strong cohesion, but locally the actors may be strongly cohesive.

Regarding the measurement of position of the actors in the network (known as positional indicators), she shows how a given actor can extract benefits according to their position in the network and the main indicators used are classified as grade and centrality of middle (LAZZARINI, 2008). Degree centrality evaluates the number of ties that an actor has with other actors. Already the centrality of middle, evaluates the degree as a particular actor is linked, directly or indirectly (actors who are located in different parts of the network). According to Wasserman and Faust (1994) the calculation of centrality of means to evaluate the measure for each actor, verifies that this actor is part of the minor road that connects each pair with other actors in the network, because the smaller the path, the greater its centrality to middle. So an actor with high centrality of middle allows this actor is connected directly or indirectly to various parts of the network.

The figure 6 show the model architecture (octal) proposed for the construction of enterprises in service networks, in the form "*octal*", graphs, trees and arrays. However the mathematical formula used was N(N-4.5)/2 for numbers of bonds observed (totaling 20 actors from the root) and the measure of density, the number observed on the network divided by the maximum number of links. The value of 4.5 is the result of the total number of elements in the first row divided by 2, which corresponds to the maximum number of main actor's relationship with the other actors in the network.

	A	B	C	D	E	F	G	H	I			
A		1		1		1		1		A		
B	1		1		1		1		1	B		
C		1		1		1		1		C		0,5
D	1		1		1		1		1	D		
E		1		1		1		1		E		1
F	1		1		1		1		1	F		
G		1		1		1		1		G		1
H	1		1		1		1		1	H		
I		1		1		1		1		I		1
	A	B	C	D	E	F	G	H	I			
												1
										Total =		4,5

Figure 6 -Matrix octal structure of an enterprise networking, author

Figure 6 represents the array and network configuration "octal" balanced in relation to the actors connected on that network. The merged form defines the control mechanism of trade in communication with reducing conflicts between these actors. Then define the octal structure as shown in Figure 7. The structure can be increased or decreased in accordance with the existing interactions between actors. The general formula for calculation can be defined as N (N-(N-d))/2, where d is the total number of diagonals counting from the main diagonal. For N = 11 (number of actors in the network) the number of observed ties has approximately 30 related actors (above the main array), represents (11 (11-5.5))/2 = 30.25 relationships between actors.

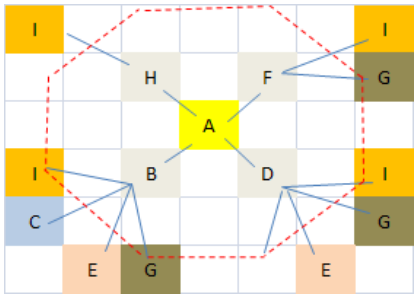


Figure 7 -octal structure of an enterprise networking, author

Figure 7 shows the structure in octal format of actors, relations between these actors that determine the measures of network structure "octal" proposed in this work. The setting was obtained of the array shown in Figure 6, which determines the balanced relationship based on the concepts of density, centrality and of fragmentation. For this it is necessary to establish the new configuration (based on the array of figure 6) forming the octal model.

The actors B, C, G and I are connected directly or indirectly to the actors of the inner layer which are the actors B, D, F and H and with the central actor, moreover, can be connected or disconnected from the network to establish their communications and exchanges of information. On the new architecture can exist several different ways of settings, keeping the consistency of the initial structure. The new structure may be linked to their peers that have the same types of businesses or services (played by the American actors that has the same color) or to connect with groups that perform services or sell different products (represented by actors who have different colors), as shown in Figure 8.

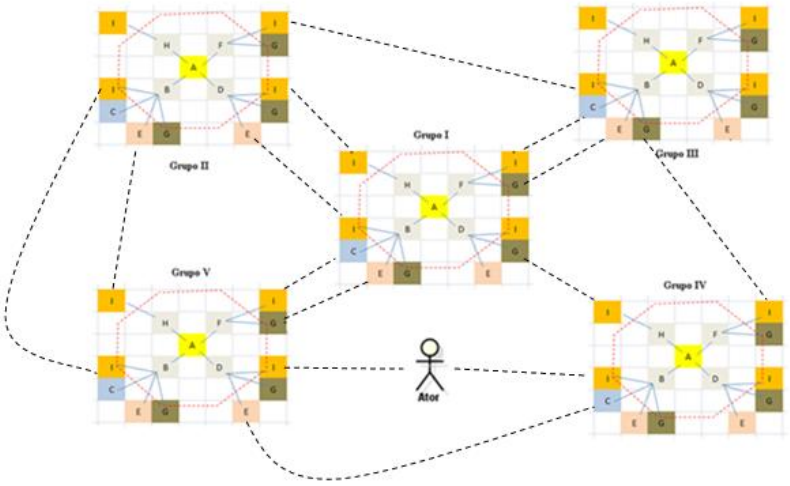


Figure 8 -Architecture octal structure of a company in interconnected networks to other networks, author

The architecture of figure 8 shows the exchange of services between actors of different groups to achieve their common goals. Each group has its main actor by applying the techniques of measures of density, centralization, fragmentation, and degree of centrality. In this way it is possible to apply also the techniques of structural holes in order to obtain advantages in the negotiations. The actor (represented in Figure 8) shows how can extract more benefits according to its positioning between the groups on the network. The nodes (*nodes*) that have the same colors have in common the same interests and types of services or products in common (companies in the same sector), nodes (*nodes*) of different colors (interconnected) represent alliances with adjacent sectors companies but which complement each other.

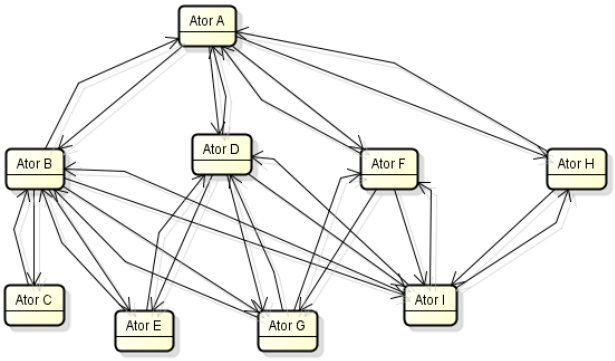


Figure 9 -Structure Structural Holes company networks, author

In Figure 9 actors represent behaviors (Exchange or sharing services) of the companies or individuals belonging to companies in networks. Right now there is Exchange of information in the search or location of services provided between the actors to combine existing resources and obtain advantages in distinct parts that are disconnected from the network. Second Lazzarini (2008), the lack of links between actors creates a structural hole that can be exploited. The benefits of this exploration (using the graph in Figure 8) may also allow the actors to combine existing resources in others parts of the network.

Networks with different levels of density correspond to the number of loops observed in the network about the maximum possible number of ties that can be established between actors (LAZZARINI, 2008). The results obtained from the comparison between the "classic" model and the model "octal" have as values for the densities (for a total of 20 actors and 9 ratios) of 99.87% for model performance "octal", while the "classic" model a value of 55.55% of performance. According to Coleman (1988), the density has a fundamental theoretical significance, because it attaches to dense networks a peculiar function, allowing the maximum flow of information between actors.

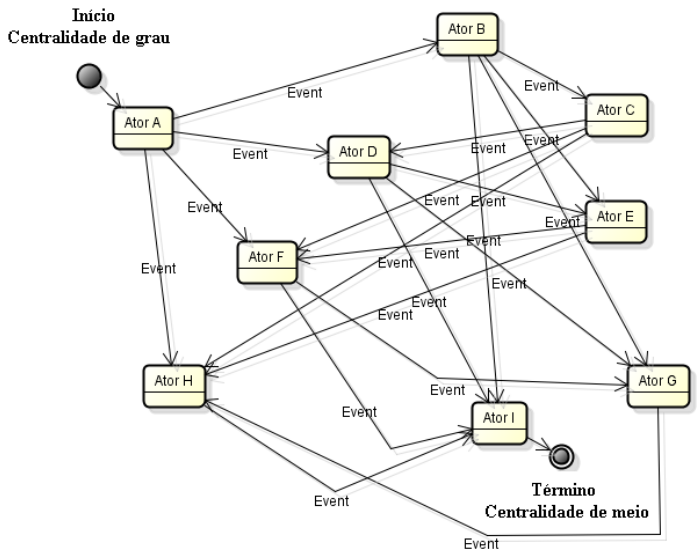


Figure 10 -octal graph structure of a company in networks, author

Figure 10 shows the actors, and state transitions between these actors to Exchange or share services and in addition, define the behavior of firms in networks. In this phase it is possible to establish the types of possible relationships to network and establish the position of the actors and the measures of centrality of these actors to configure the best alliances and ties.

Figure 11 shows the tree structure of an octal architecture. The structure allows analyzing the intensity of relations in horizontal and vertical levels, as shown in the degrees of intensity of colors in horizontal line 1 level of the hierarchy.

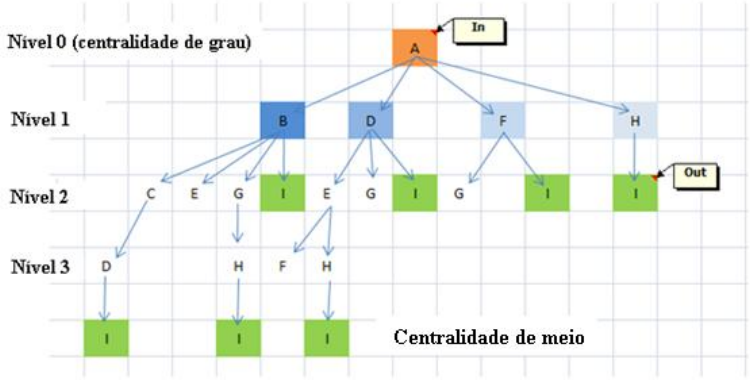


Figure 11 -An octal tree structure of an enterprise networking, author

Figure 11 shows the structure in hierarchical levels, where represent the measures of position of the actors according to their centrality that can be of degree or of kind. Centrality of maximum degree centrality of the central actor (root), already the centrality of middle evaluates the maximum degree of interconnectedness that an actor is connected directly or indirectly with other actors that are disconnected in different parts of the network, where all entrances and exits are focused on a specific actor (in the example in Figure 11, corresponds to the actor "I"). The darker blue color shows that has a centralized of greater degree, since there is a larger number of ties that the actor has in relation to other actors and the lighter blue color less number of interconnected ties to this actor.

Structural holes is the absence of a bond between disconnected networks. According to Burt (1992), the non-existence of ties between actors of disconnected networks creates a structural hole and allows opportunities in negotiations to be presented. Actors must seek positions on your network in order to avoid redundant links (must make contacts with actors who do not have ties with each other). An actor can be represented by individuals or businesses that relate to other networked enterprises to obtain benefits and resources by connecting to the various portions of this network as shown in Figure 12.

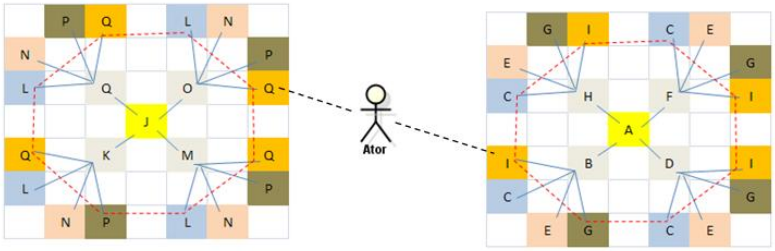


Figure 12 -Structural hole in a company "octal" network, author

Figure 12 shows the octal structure where the actor (can be individuals or companies) connected to the other companies of different networks but that has in common services that can be shared. This actor has just interconnection using informal structures of relationship with high centrality of middle.

Actors must seek positions in your network and get contacts with actors who do not have ties with each other, because it allows actors can combine existing resources in separate parts and disconnected from a particular network (BURT, 1992).

An organization that wants to develop a new product or service can form alliances with companies of different sectors initially disconnected (LAZZARINI, 2008). Networks of small firms allow company to preserve their specialization in a particular area and reduce contractual risks in market transactions (PIORE and SABEL, 1984; POWELL, 1990). Thus, an inter-organizational network can be considered as a new type of organization of several autonomous units and connected by means of links of different types. These types of bonds can be of type vertical or horizontal (ZENGER and HESTERLY, 1997). A vertical chain is a network of ties sequentially chained (LAZZARINI 2008). A vertical chain allows you to manage sequential interdependencies between the various actors involved, where each actor forensics a product or service that is the input of the other actor (THOMPSON 1967). Several authors have analyzed how to organize vertical chains: what types of agreements between actos can be established, to ensure that there is compliance with these agreements and how to provide changes to increase the quality or reduce costs along the chain (ZYLBERSZTAJN, 1995; ZYLBERSZTAJN and FARINA, 1999; NICKERSON et al., 2001).

A horizontal network occurs between companies of the same sector or companies of adjacent sectors (LAZZARINI, 2008). Horizontal networks may establish relationships with companies belonging to sectors that are complementary to each other (BRANDENBURGER and NALEBUFF, 1996). Horizontal networks feature two types of interdependencies between actors that sãod and aggregation and reciprocal. A inter-dependencies of type aggregation are weaker (THOMPSON 1967). Contact resulting from common interests, it is not necessary to question and develop intense relations since they may be momentary (SCHNEIDER, 2004). Figure 13 shows the octal structure that aggregates the concepts of vertical and horizontal networks and dynamic management utilizing control techniques for cloud computing, SOA and *web services*.

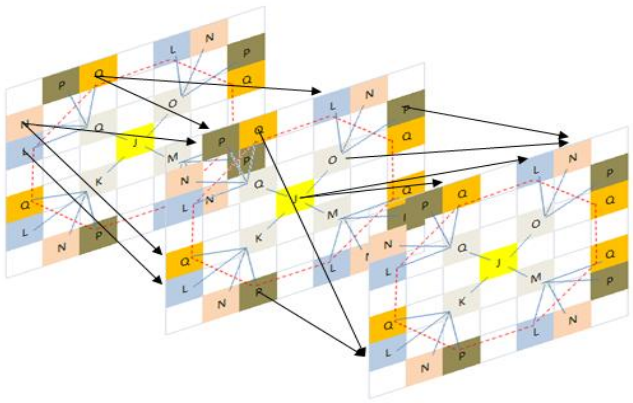


Figure 13 -Structure of a network enterprise "octal" in the vertical, horizontal and netchains networks format, author

With the goal of establishing and structuring a more stable network, the purpose of this work presents the results of an analysis for enterprise configuration on networks for the distribution of services using *web services* and cloud computing techniques. The table 1 uses the shape of calculation model density maximum number of loops and the measure of density proposed by Lazzarini (2008). Then apply the calculation model for distribution of services of the *octal* architecture and the graphic models resulting from its calculations as a comparison of their results, in addition to their comments and discussions.

Measures	Actors (nodes)	Classic model (results) "ties x density"	Proposal model (results) "ties x intensity"	Observations
Maxim numbers ties	2	1 (ties)	1 (laço)	The relations and ties are the same.
Density measesure		2 (density)	2 (densidade)	
Maxim numbers ties	3	3 (ties)	3 (laços)	The relations and ties are the same.
Density measesure		1 (density)	1 (densidade)	
Maxim numbers ties	4	6 (ties)	6 (laços)	The relations and ties are the same, but the density are increase in both.
Density measesure		0,666666667 (density)	0,666666667 (densidade)	
Maxim numbers ties	5	10 (ties)	10 (laços)	The relations and ties were change, but the proposal model value not changed and the classic model are decreased.
Density measesure		0,5 (density)	0,666666667 (densidade)	
Maxim numbers ties	6	15 (ties)	10 (laços)	The relations and the ties are changed. The proposed model hold the same value and the classic model the value decrease.
Density measesure		0,4 (density)	0,666666667 (densidade)	
Maxim numbers ties	7	21 (ties)	10 (laços)	The relations and the ties are changed. The proposed model hold the same value and the classic model are decrease.
Density measesure		0,333333333 (density)	0,666666667 (densidade)	
Maxim numbers ties	8	28 (ties)	10 (laços)	The relations and the ties are changed. The proposed model hold the same value and the model classic are decrease.
Density measesure		0,285714286 (density)	0,666666667 (densidade)	
Maxim numbers ties	9	36 (laços)	10 (laços)	The relations and the ties are changed. The proposed model hold the same value and the model classic are decrease.
Density measesure		0,25 (densidade)	0,666666667 (densidade)	

Table 1 -Comparative Table of Companies in networks (classical model) and distribution services in cloud computing, the author.

Table 1 shows the results obtained from the comparison between the measurements of maximum figures and ties in relation to densities of classical models and model "octal" by the amount of a company's existing actors in networks. From the aggregation of 4 actors and 6 ties, the network suffers change compared to densities. In the classic model network performance begins to decrease while the performance of the model "octal" holds steady as the numbers of actors and increase ties. The increase of number of nodes does not allow calculating the extent necessary when the actors in the network increase with the analyses of the actual performance of the network. As the authors Lazzarini, Greift, Holf, Stiglitz and Jones, the values obtained from densities of a network establish measures and levels of relationships of important information in a network and this justifies the importance of the results of the density of a network. The results generated by the octal model shows the critical limits to establish links between the nodes that can be a relationship between individuals or companies.

In dense networks it is possible to apply sanctions to groups of people who do not comply with the rules established by the groups. In dense networks allow the actors to apply collective sanctions, because this type of service (LAZZARINI, 2008). As (Greif ET al., 1994), this type of mechanism is the basis on which the informal groups of trade and strengthening of credit (HOLF and STIGLITZ, 1990). So the more dense is a local community, the easier it will be to support cooperative relations, because the density aims to facilitate cooperation between the actors (LAZZARINI, 2008). In addition to facilitate communication among the actors in creating a culture based on norms and values developed over time, in pursuit of common goals (JONES, 1997).

The figures 14 and table 2 describes the results obtained from the analysis of the density of the "classic" model in relation to the proposed model of density by applying the model of enterprises in services distributed networks with the SOA, *web services* and cloud computing. The work also has the aim of showing the benefits of this new architecture for a service delivery configuration using dynamic virtualization techniques, autonomous which can behave in the form synchronized or not, according to the needs of resources sharing in cloud computing.

	Modelo de cálculo ("clássico")			
		LaçoMax=	36	Número máximo de laços (Não Direcionais)
nós (atores)	laços(Obs)			
9	20			Não pode haver atores sem laços.
		Densidade=	0,555555556	Medida de densidade
			0,277777778	

Figure 14 Model (classical) calculation of a company's networks, author

Figure 14 shows the calculation model used for definitions and analyses of comparisons of maximum densities and ties for quantities of actors and established ties between them. The results are generated as shown in the table.

Modelo "clássico"			
nós(atores)	Densidade(50%)	LaçoMax	Densidade
1			
2	0,50	1	1,00
3	0,50	3	1,00
4	0,50	6	1,00
5	0,10	10	0,20
6	0,24	15	0,47
7	0,24	21	0,47
8	0,25	28	0,50
9	0,25	36	0,50

Table 2 results obtained from the model (classical) calculation of a company's networks, author

In table 2 shows the values of the simulations and the values generated for maximum density limits and of 50% of its value. For we (actors) and ties maximum establish down between the actors (total 9 actors), interdependencies increase exponentially and the describe flow of information quickly. In this way communication and the exchange of transaction services are unstable. Figure 15 graphically shows the results generated by the simulation.

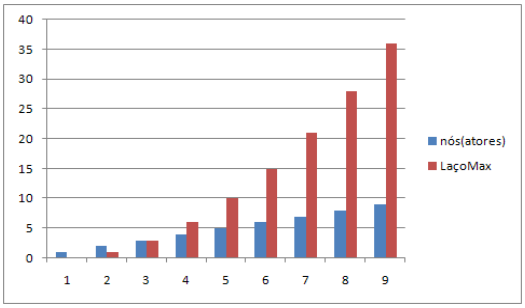


Figure 15 -Model (classical) graph of the calculations of a company in networks of actors in relation to bonds, author

Figure 15 represents the results of the analysis of the numbers of nodes in relation to bonds or relationships established between nodes. As there is an increase in the numbers of us there is a growth in the amount of necessary links required to establish communication or exchange of services, which is reduced in proportion to 8/36 (for a total of 9 us) the intensity of this relationship as you increase the number of nodes. In Figure 16 shows the results generated for the increase of us relative density (information flow).

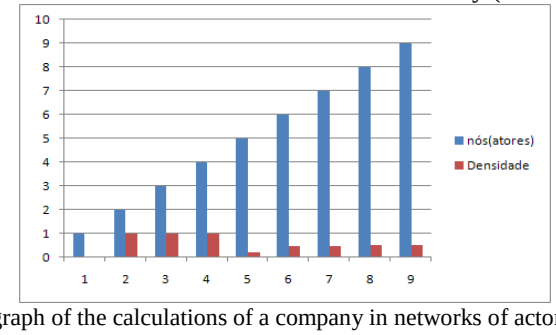


Figure 16 -Model (classical) graph of the calculations of a company in networks of actors in relation to densities author

Figure 16 shows that the increase of us above 50% there is a significant drop in the density. To maintain the stability of information flow between these actors, the limit of reliability of the relationship remains around 1/4 and 0.5/9 (for a total of 9 actors) of that relationship, which equates to 25% and 0.5% risk analysis analysis (margin of error = 20%). The figure 17 shows the calculation model to generate an analysis between the two models presented (classic and octal).

	Modelo de cálculo("octal")			
		LaçoMax=	20,0025	Número máximo de laços (Não Direcionais)
nós (atores)	laços(Obs)			
9	20			Não pode haver atores sem laços.
		Densidade=	0,999875016	Medida de densidade
			0,499937508	

Figure 17 -Model (octal) of calculating a company's networks, author

Figure 17 shows the application to simulate the calculations generated in relation to the numbers of actors and ties established between them, beyond the values of the measures of densities. Table 3 shows the results applied to the octal model.

modelo proposto "octal"			
nós(atores)	Densidade(50%)	LaçoMax	Densidade
2			
3			
4			
5	0,45	1	0,89
6	0,14	4	0,92
7	0,47	8	0,93
8	0,48	13	1,30
9	0,49	20	0,99

Tabela 3 -Resultados obtidos do modelo (octal) de cálculo de uma empresa em redes, autor

In table 3 notes the implementation of the proposed model (octal) increases the value of its density with increasing of number of nodes and links, also sets a limit of ties to the maximum use of information flow (or exchange of services and resources) between the actors. Figure 18 shows graphically the results generated from the proposal of this work.

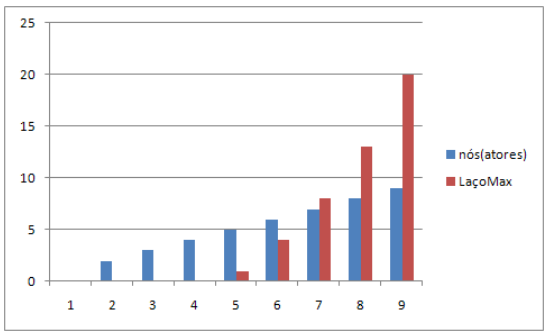


Figure 18 -Model (octal) chart of the calculations of a company in networks of actors in relation to bonds, author.

Figure 18 shows the results generated by the simulation and the relationship of nodes and ties established between these actors to the octal model. It is observed that the increase of the influence ties only when the amount is above 50% of the total number of nodes on the network at a maximum ratio of 8/20 or 8 nodes to 20 ties (for a total of 9 nodes). This shows that the octal model has increased efficiency in its application to relations number above 50% of relationship between individuals or companies. Figure 19 shows graphically the results generated by the model octal.

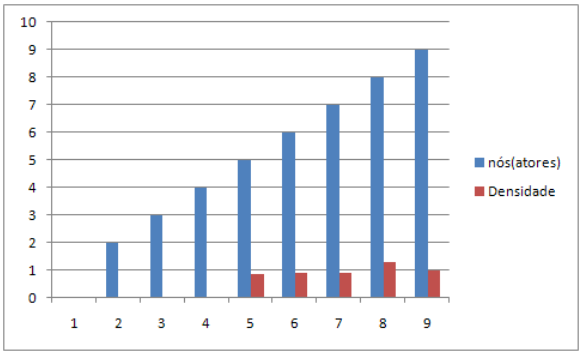


Figure 19 Model (octal) chart of the calculations of a company in networks of actors in relation to densities author.

Figure 19 shows the generated results to the analysis of the simulations between actors and density (information flow) for model octal. It is observed that the increase of us regarding the density remains stable or establishes a limit to establish service contracts between individuals or companies of 0.9/5 and 1/9 (for a total of 9 actors) which equates to 18% and 11% of risk analysis of contracts (margin of error = 7%).

nós	Num. de laços máximo "Clássico"	Cáculos (densidade) "Clássico"	Num. de laços máximo "Octal"	(Cálculos de densidade) "Octal"
1				
2	1	1,00		
3	3	1,00		
4	6	1,00		
5	10	0,20	1	0,89
6	15	0,47	4	0,92
7	21	0,47	8	0,93
8	28	0,50	13	1,30
9	36	0,50	20	0,99

Table 4 - Comparative obtained from the model (classical) relative to the model "Octal" a business networking, author

The table 4 shows the results of the simulation loops and densities for the octal mkodelo. For a total of 9 we the density for the classic template has greater efficiency when the numbers of links are below 50% of the totality of its nodes. So for quantities of us above 50% of the total of us the octal model has its improved efficiency in almost 100% of its implementation and performance, also sets a limit for the intensity of their relationship. Figure 20 shows the result of the comparison charts of two model.

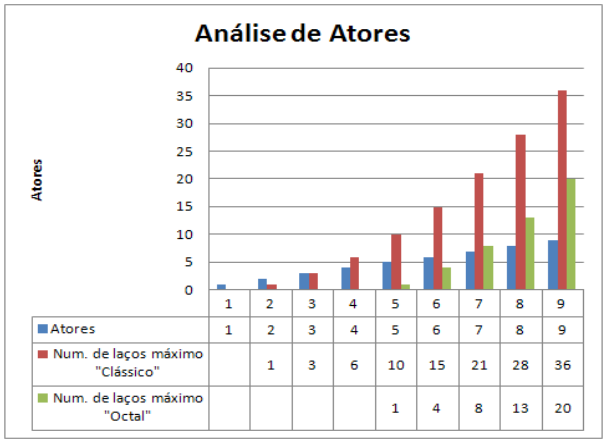


Figure 20 -Comparison chart obtained from the model (classical) relative to the model "Octal" Actors and maximum bond of a company in networks, author

Figure 20 shows the results of the comparison between the two models presented (for a total of 9 nodes). In the classic model network performance begins to be perceived already in the early ties or service contracts. The landmark and leveling the network happens to the classic model when the network reaches 30%, for model octal your performance starts from 70%. The ratio of the intensity of relationship in average is 8/21 for the two models presented (40% efficiency for model octal), besides the octal model sets a limit of interconnection between individuals or companies. Figure 21 shows the relationship of density and actors of a network.

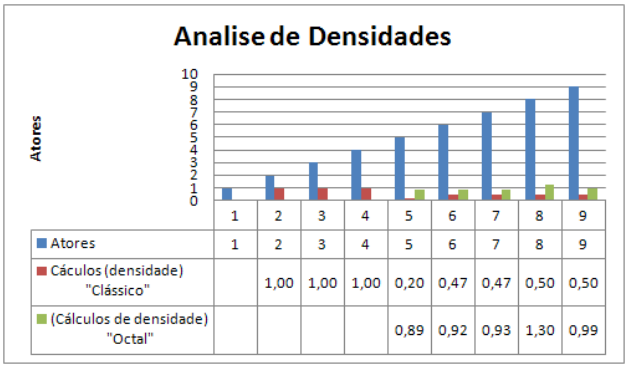


Figure 21 comparison chart obtained from the model (classical) relative to the model "Octal" actors and densities of a company in networks, author

Figure 21 shows the results of density in the graphic form of the models presented (for a total of 9 knots). While the model remains stable the octal interdependency the relationship between the actors in a network there is a reduction of density or flow of information between the network actors when numbers of actors achieve 50% of its entirety. To the octal model its density or information flow capacity increases when the number of actors increases. The table 5 shows the performance between the two models presented.

Análise comparativa de desempenho das densidades do modelo "Clássico" e "Octal"						
Atores utilizados na configuração	Num. De laços utilizados	Valor da densidade "Clássica"	Desempenho da densidade em % "Clássica"	Valor da densidade "Octal"	Desempenho da densidade em % "Octal"	Observações
9	1	0,027	2,7	0,049	4,9	
9	2	0,055	5,5	0,099	9,9	
9	3	0,083	8,3	0,149	14,9	
9	4	0,111	11,1	0,199	19,9	
9	5	0,138	13,8	0,25	24,9	
9	6	0,166	16,6	0,30	29,9	
9	7	0,194	19,4	0,35	34,9	
9	8	0,222	22,2	0,40	39,9	
9	9	0,25	25	0,449	44,9	
9	10	0,277	27,7	0,499	49,9	
9	11	0,305	30,5	0,549	54,9	
9	12	0,333	33,3	0,599	59,9	
9	13	0,361	36,1	0,649	64,9	
9	14	0,388	38,8	0,699	69,9	
9	15	0,416	41,6	0,749	74,9	
9	16	0,444	44,4	0,799	79,9	
9	17	0,472	47,2	0,849	84,9	
9	18	0,5	50	0,899	89,9	
9	19	0,527	52,7	0,949	94,9	
9	20	0,555	55,5	0,99	99	

Table 5 -Results obtained from the analysis of the performance of the densities of the model "Classic" model with the "octal" a business networking, author

The table 5 shows the results of the performances of the two model for performance analysis and density of a network when there is an addition of ties (for a total of 20 bonds) that network. It is observed that there is a performance reduction (on average of 27.7/49.9 or 55%) to the classical model in relation to the octal model. Figure 22 graphically shows this relationship.

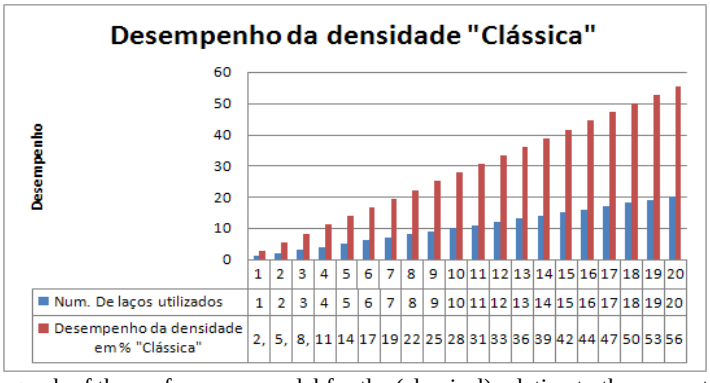


Figure 22 -Comparative graph of the performance model for the (classical) relative to the amount of a company of actors used in networks, author

Figure 22 shows the evolution of the number of ties to the classical model in relation to increased ties and performance loss (maximum) this network, in a proportion of 20/55 or 36%, and performance (minimum) of 1/2 or 50% (margin of error = 14%), for a total of 20 ties of a total of 9 nodes. Figure 23 shows the results generated by the model octal.

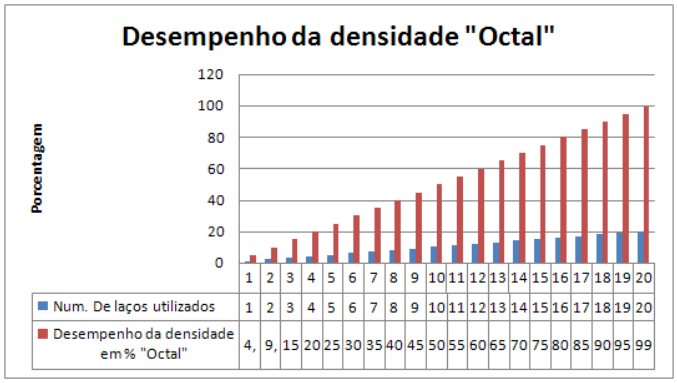


Figure 23 -Comparative graph of the performance for the model (octal) in relation to the amount of players used a company in networks, author

Figure 23 shows the evolution of bond numbers to octal model in relation to increased ties and performance loss (maximum) this network, in a proportion of 20/100 or 20% and performance (minimum) of 1/4 or 25% (margin of error = 5%) for a total of 20 ties of a network with 9 nodes.

3.5.2. Application and simulation

The simulation of the proposal was performed using a planning schedule, availability of teachers, disciplines as the available courses, schedules, shifts of classes and the rooms as each campus allocations of the IES. The figure 24 shows the application used for simulation and application of the proposal of this work.

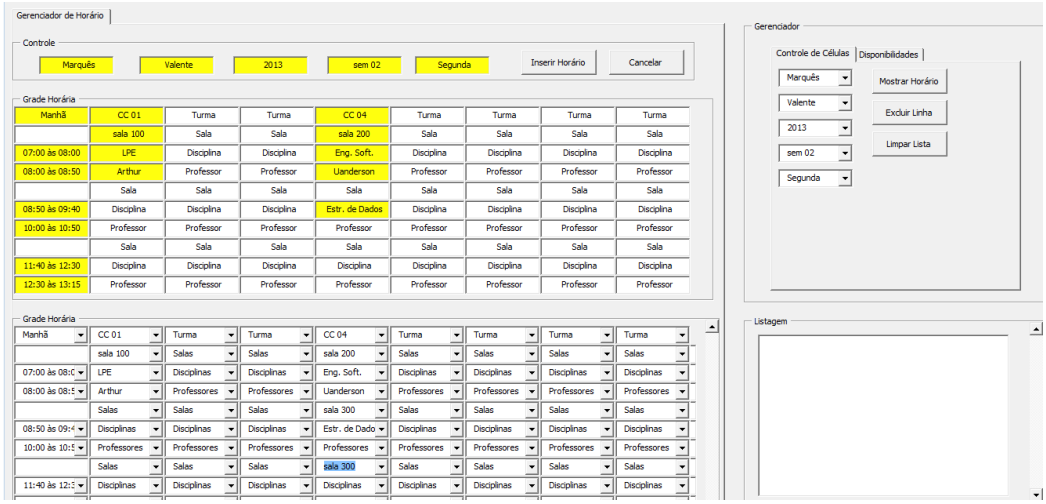


Figure 24 -Main application screen distribution of classes, author

Figure 24 is the interface used for the application of the techniques of cloud computing, SOA and *web services*. The main services are contracts of teachers, availability of time and subjects designated for teaching, student enrolment and registration location, availability of rooms of the campus, planning schedules made by the coordination, the specific areas of expertise offered by half the year. The service contracts are based on SOA architecture and is based on the design of services, purpose, ability to reuse, strategic goals and service-oriented computing. In the implementation of the application uses the techniques of *web services* and cloud computing (through the virtualization of *datacenters*). The Foundation of web services is linked to the service logic, logic of processing messages, service contract and exchange of messages, which are responsible for building service-oriented solutions. The main components of the service oriented architecture are the inventories of services and resources for reuse. Communication between components using the proctocolos HTTP (*Hypertext Transfer Protocol*), HTTPS (*Hypertext Transfer Protocol Secure*), SMTP (*Simple Mail Transfer Protocol*) and Internet.

Descriptions of message exchanges are performed by SOAP (*Simple Object Access protocol*), JMS (*Java Message Service*), request/response protocol that can be synchronously and asynchronously. The registration of services are business components (name, description, and contracts), techniques of information (languages, technologies and infrastructure access) and services (operations, taxonomies, rules, procedure and service elements). The SOA is the alignment between business model (processes) and IT, as it involves the model of governance, business requirements and IT capabilities. SOAP (*web services Access Protocol*) is the Protocol of access to services and their structure described using XML (*Extensible Markup Language*) responsible for communication between *web* applications and *web services*applications. The communication interface is performed through the WSDL (*Web Services Description Language*) which describes a *web service* that contains the operations and the input and output formats of each operation. Registering a web services in UDDI (*Universal Description Discovery and Integration*) of a *web services*provider, where are registered and published, because the UDDI are directories of *web services*.

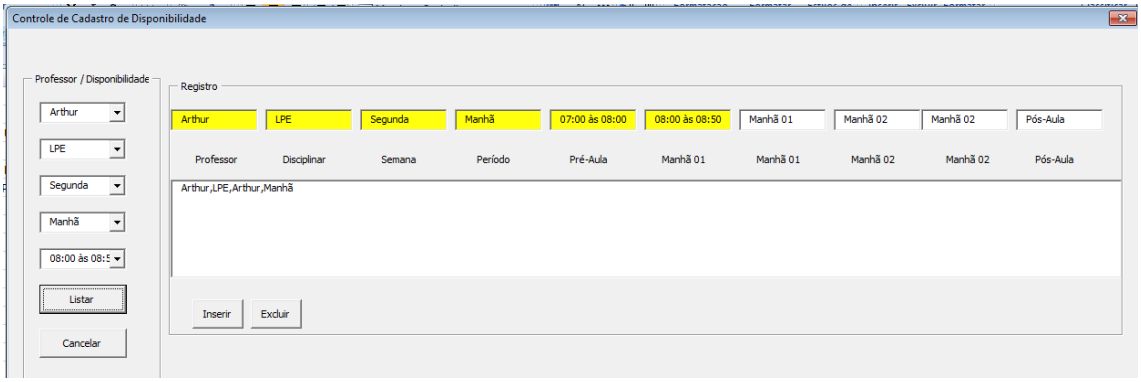


Figure 25 -Screen Application availability of teachers and classes, author

Figure 25 show a communication interface for control and management of schedule and availability fill disciplines input by teachers. This is the main component for the creation of the distribution schedule, classes, subjects and classes each semester of the academic year of an IES.

IV. ANALYSIS OF THE RESULTS

In relation to the analysis of the results, are monitoring the application performance of enterprise networking (it takes into account the analysis of the readings, the causes and effects of communication and efficiency compared to the costs involved). This is also indispensable for the verification of the benefits of new infrastructure with cloud computing and *web services* technologies, beyond the control of services using SOA design patterns.

Modeling of service-oriented computing and services, it should provide the results obtained and their advantages experiences expected according to the studies carried out within the criteria and limits, as shown in the results below.

- ✓ Network configuration "octal" balanced in relation to the actors connected on that network from the array.
- ✓ The merged form defines the control mechanism of trade in communication with reducing conflicts between these actors
- ✓ The new architecture can exist several different ways of settings, keeping the consistency of the initial structure.
- ✓ The configuration can be obtained from matrix that determines the balanced relationship based on the concepts of density, centrality and of fragmentation.
- ✓ The actors are connected directly or indirectly to the actors of the inner layer of the octal model with the central actor, moreover, can be connected or disconnected from the network to establish their communications and exchanges of information.
- ✓ The new structure may be linked to their peers that have the same types of businesses or services (played by the American actors that has the same color) or to connect with groups that perform services or sell different products (represented by actors who have different colors),

- ✓ Each group has its main actor by applying the techniques of measures of density, centralization, fragmentation, and degree of centrality. In this way it is possible to apply also the techniques of structural holes in order to obtain advantages in the negotiations.
- ✓ The nodes (*nodes*) that have the same colors have in common the same interests and types of services or products in common (companies in the same sector), nodes (*nodes*) of different colors (interconnected) represent alliances with adjacent sectors companies but which complement each other.
- ✓ The mechanisms of state transitions between these actors allows show Exchange or sharing of services and in addition, define the behavior of firms in networks or individuals. It is possible to establish the types of possible relationships to network and establish the position of the actors and the measures of centrality of these actors to configure the best alliances and ties.
- ✓ The structure in hierarchical levels, where represent the measures of position of the actors according to their centrality that can be of degree or of kind.
- ✓ The intensity of the colors of the hierarchical levels shows that has a centralized of greater degree, since there is a larger number of ties that the actor has in relation to other actors and the lighter blue color less number of interconnected ties to this actor.
- ✓ The octal structure aggregates the concepts of vertical and horizontal networks and dynamic management using control techniques for cloud computing, SOA and *web services*.
- ✓ The new architecture allows you to establish service delivery configuration using dynamic virtualization techniques and autonomous which can behave in the form synchronized or not, according to the needs of resources sharing in cloud computing.
- ✓ The calculation presented in model allows you to define and analyze the maximum ties comparisons and densities in relation to quantities of actors and ties established between them
- ✓ The octal model sets a limit of interconnection between individuals or companies.
- ✓ The octal model its density or information flow capacity increases when the number of actors increases.
- ✓ Allows you to calculate the density, the number of ties, the intensity of relationship and the performance of a network.

V. CONCLUSION

Due to the evolution of the various modeling techniques of them stand out in the current times is the SOA, because it allows to relate business and IT services. Strategic alignment of an organization can be used. Have the web services are implemented allows the idea of services through the internet and be accessed anywhere in the world business logic and its realization with the use of web technology. For this virtualization of datacenters has the role to consolidate IT infrastructure to increase the performance and availability of application offering a dynamic configuration to meet the new demands and requirements with low investment cost. The aim of this study was to propose a model for deploying networking companies in applying the architecture of service orientation and cloud computing techniques with web services for control and management planning academic schedule an IES. The research method was a case study of a set of units, or geographically distributed campus where many teachers teach in different units and coordinators also coordinate several units located in different regions. In relation to the practice and application of simulation - highlight the interdependence of services and cooperation agreements on integration and sharing of resources employed.

The results indicate the implementation of business policies with the IT environment and implementation distribution and technology services. In the management of academic planning results indicate a practice of sustainability and low cost. Thus the results obtained allowed to put into practice the concepts and theories applied in business networking. It was also possible to determine gain time and generate results even with the limitations presented that restricted their automation, efficiency and performance. However there is also evidence that it is possible to deepen the research that leads to even better results with the performance and involvement of more engineers and teachers who participate in the network. Furthermore the impact it has proved possible to facilitate resource allocation geographically distributed datacenters with virtualization. Finally, it should be emphasized that the inter - organizational networks are placed in the context of the current reality and in that sense to be competitive organizations must be aligned with the new technologies and management models for organizations .

BIBLIOGRAPHICAL REFERENCES

[1.] BRANDENBURGER, A.; NALEBUFF, B. J. **Co-opetition**. New York: Currency Doubleday, 1996.

[2.] BURT, R. S. **Cooptive corporate actor networks: a reconsideration of interlocking directorates involving american manufacturing**. Administrative Science Quartely, v.25, p.557-582, 1980.

[3.] COLEMAN, J. S. **Social capital in the creation of human capital**. American Journal of Sociology, v.94, p. 95-120, 1988.

[4.] DEITEL, H. M. **C# Como Programar**, Pearson Education do Brasil Ltda. São Paulo – SP, 2005.

[5.] ERL, Thomas. **SOA Princípios de Design de Serviços**, Pearson Education do Brasil, São Paulo- SP, 2009.

[6.] FUSCO, José Paulo Alves e SACOMANO, José Benedito. **Alianças em redes de empresas: modelo de redes simultâneas para avaliação competitiva**, Editora Arte & Ciência, São Paulo – SP, 2009.

[7.] GREIF, A. **On the interrelations and economic implications of economic, social, political, and normative factors**: Reflection from two late medieval societies. In: DROBAK, J. N.; NYE, J. V. C.. The frontiers of the new institutional economics, San Diego: Academic Press, 1997. P.57-94.

[8.] GREIF, A. **On the interrelations and economic implications of economic, social, political, and normative factors: Reflection from two late medieval societies**. In DROBAK, J. N.; NYE, J. V. C. **The frontiers of the new institutional economics**. San Diego: Academic Press, 1997. P. 57-94.

[9.] HAMMERSLEY, Eric; **Profissional VMware Server**, Wiley Publishing. Inc., Indianapolis, Indiana, USA, 2007.

[10.] HOLF, K.; STIGLITZ, J. E**. Imperfect information and rural credit markets: Puzzles and policy perspectives.** In: HOFF, K. **The economics of rural organization: theory, practice, and policy**. Oxford: Oxford Univeresity Press, 1993.

[11.] JONES, C. **A general theory of network governance: Exchange conditions and social mechanisms**. Academy of Management Review, v. 22, n. 4, p. 911-945, 1997.

[12.] JORGESEN, David. **Desenvolvendo Serviços Web .NET com XML**, Editora Alta Books Ltda. Rio de Janeiro – RJ, 2002.

[13.] KIRSCHIBAUM, C.; VASCONCELOS, F. C. D. **Tropicália: Manobras estratégicas em redes de músicos**. Revista de Administração de Empresas, v.47, n.3, p.-26, 2007.

[14.] LAZZARINI, Sérgio G. **Empresas em rede**, Cengage Learning, São Paulo – SP, 2008.

[15.] NICKERSON, J. A. et al. **Market position, resource profile, and governance: Linking Porter and Williamson in the context of International Courier and Small Package Services in Japan**. Strategic Management Journal, v. 22, p. 251-273, 2001.

[16.] PIORE, M. J.; SABEL, C. F. P. **Administrative Organization**. Englewood Cliffs: Prentice-Hall, 1960.

[17.] POWELL, W. W. **Neither market nor hierarchy: Network forms of organization. Research in Organization Behavior**, v. 12, p. 295-336, 1990.

[18.] SCHNEIDER, B. R. **Business politics and the State in twentieth-century Latin America**. Cambridge: Cambriedge University Press, 2004.

[19.] THOMSOM, J. D. **Organizations in action: Social science bases of administrative theory**. New York: McGraw-Hill, 1967.

[20.] TONINI, A. C.; CARVALHO, M. M.; SPINOLA, M. M**.; Contribuição dos modelos de qualidade e maturidade na melhoria de software. Revista Produção**, v.18, n. 2, p. 275 – 286, 2008.

[21.] TONINI, Antonio Carlos; CARVALHO, Marly Monteiro de e SPINOLA, Mauro de Mesquita. **Contribuição dos modelos de qualidade e maturidade na melhoria dos processos de *software***, ABEPRO Produção, v18. São Paulo – SP, 2008.

[22.] VERAS, Manoel. **Datacenter Componente Central da Infraestrutura de TI** (Tecnologia da Informação), Brasport Livros e Multimídia Ltda. Rio de Janeriro – RJ, 2010.

[23.] VERAS, Manoel. **Virtualização Componente Central do Datacenter**, Brasport Livros e Multimídia Ltda. Rio de Janeiro – RJ, 2011.

[24.] WASSERMAN, S.; FAUST, K. **Social network analysis**. Cambrigde: Cambridge University Press, 1994.

[25.] ZENGER, T. R.; HESTERLY, W. S. **The disaggregation of corporations:Selective intervation, high-powered incentives, and molecular units.** Organization Science, v. 8, n. 3, p.209-222,1997.

[26.] ZYLBERSZTAJN, D. **Governance structures and agribusiness coordination: Transaction cost economics based approach**. **In:** GOLDBERG, R. A**. Research in Domestic and International Agribusiness Management**. Boston: JAI Press, 1996. P. 245-310.

[27.] ZYLBERSZTAJN, D.; FARINA, E. M. M. Q. **Strictly coordinated food systems: Exploring the limits of the Coasian firm.** International Food and Agribusiness Management Review, v. 2, p. 249-265, 1999.