

Automation of Wheelchair Using Iris Movement

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Abstract

We Generate The Digital Data. Then This Digital Data Is Sent To The Psoc Microcontroller For The Further Processing. We Have Also Provided The Provision For Obstacle Detection By Using Ir Sensor. It Will Help Us To Stop The Chair At Predefined Distance After Sensing The Obstacle. We Have To Recognize The Iris Movement And Move The Chair According To The Location Of Iris In Left, Right, Forward And To Stop The Chair.

Keywords: Disable People, Electronic Wheelchair, Electronic Wheelchair Using Image Analysis Technique, Eye Movement, Finding Pupil Location, Ir Sensor, Psoc Module

I. Introduction

The Chair Is Designed To Help The Paralyzed Person Who Moves On A Wheel Chair, Instead Of The Handicapped Person Moving The Wheel Chair By His Hand, The Chair Will Move Automatically To A Particular Direction As Per The Patient's Iris Movement. Webcam Captures Images Which Are Stored Into The Pc For Matlab Environment And Process Those Frames And Take The Decision According To The Result. Matlab Simulink To Perform The Different Morphological Processing On To The Images To Detect The Exact Location Of Iris. For Example, If That Person Wants To Move Towards Right Side He Has To Look Towards Right And After Processing Chair Get Moved Respective Of The Iris Movement. This Processed Digital Output Data To The Psoc Microcontroller For The Further Processing And Which Will Generate Then Output And Gives It To The Dc Motors. The More Intelligence Part Is That The Obstacle Detector. To Provide The Obstacle Proof Roaming For That Person We Have Used Ir Sensor Which Detects The Presence Of Obstacle In The Way. If It Detects Any Obstacle Within The Predefined Distance It Will Stop The Chair Automatically.

Iris Movement Controlled Wheelchair Is To Enable Critically Paralyzed People To Make Their Life More Undependable And To Provide Them Opportunity For Movement. However, To Move His/Her Own Wheelchair Through A Joystick Is Difficult For People Experience Total Paralysis In All I.E. Two Hands And Two Legs, Such As Muscular Dystrophy, Spinal Cord Injury, Amyotrophic Lateral Sclerosis, Etc. The Eye Control Is Of Great Use For Physically Handicapped And Disabled. People Who Can't To Walk And They Are Using Wheel Chairs Exert Great Amounts Of Energy Using Physical Strength To Turn A Steer The Wheels. With Iris Movement Disabled Save Their Energy And Used As A Guide For Movement And Could Use Their Hands And Arms For Other Activities. To Design A System In Such A Way That Handicapped And Disabled People Are Not Visibly Disabled. The Signals That Are Passes To Motor Driver Which Are Interface With The Wheelchair Itself. The Motor Driver That Control Both Speed And Direction To Move Wheelchair In All Direction.

The Position Of Pupil. Then The Different Position Will Be Use The Different Motion For Wheelchair. Like Motion Of Wheelchair In All Direction. Result Of Digital Image Will Be Send To Psoc Kit And That Are Connected To Motor To Control The Motion Of Wheel.

The Principle Behind This Prototype Is Based On Eye Movement Technology. This Particular Application Is Specifically For Physically Paralyzed People.

II. Background

Initially We Compared Following Systems To Get More Efficient Result And To Provide Great Ease To The Handicapped People And We Have Selected This System.

- A. The Use Of Joystick Is One Of The Solution But It Can't Be Used By Paralyzed People.
- B. Where There Is A High Level Of Incapacity Solutions Are Centered On The Use Of Other Means Such As Voice. In This Case, Presence Of Safety Sensors Is Justified With The Object Of Assisting The User To Guide The Chair.

- C. Electro-Oculographic Technique In Which Electrode Mounted On The Skin Around The Eye That Could Measure Differences In Electric Potential So As To Detect Eye Movements.
- D. By Using Eyeball Sensor To Detect Iris Movement, It Is Difficult To Get Precise Output.

III. Objective

Physically Disabled People Find Very Difficult With The Existing Assistive Devices. As There Are Many More Wheelchair Present In Market To Enable Motility, They Require Fine And Accurate Control Which Is Not Possible In Many Cases That Have Higher Disability. These Wheelchair Are Not Very Efficient And Enable The User To Move Easily Around The Working Area. In Recent Times There Have Been Various Control Systems Developing Specialized For People With Various Disorders And Disabilities. This Paper Reports For The Directing Of Wheelchair By The Movement Of Eyeball. The System Requires The Patient To Have Had Fine Command Over The Robotic Wheelchair, Its Direction Of Movement And Will Also Sense The User About The Obstacles In The Path To Avoid Collision. This Work Is Based On The Extension Of Previous Research Wheelchair Will Decide The Path And Direction As Per The Eyeball Movement. It Adds Many More Flexibility For Motion And Work For Physically Disabled People.

IV. Proposed System:

At Start The Codes Are Designed For Different Eye Positions. This Code Is Send To The Transmitter Of PsoC Through Serial Link. The Transmitter Consist Of Two Sections PsoC Microcontroller And Encoder. Firstly PsoC Microcontroller Sends The Required Digital Data To Encoder.

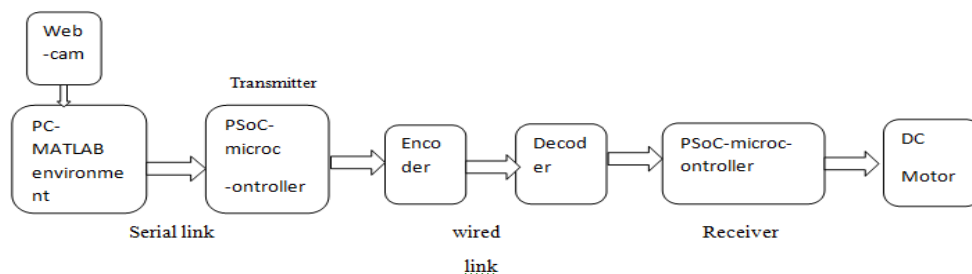


Figure 1 Block Diagram of System

Encoder Takes The Data And Transmit To The Receiver Through Wired Link. At The Receiver Side, Receiver Receives The Digital Data And Process It For Further Operation. Again Receiver Divided Into Two Sections Decoder And PsoC Microcontroller. The Received Digital Data Decoded By Decoder And Its Output Is Given To The PsoC Microcontroller. The PsoC Microcontroller Drives Dc Motors Depending Upon The Decoded Data And Wheelchair Moves.

Webcam:

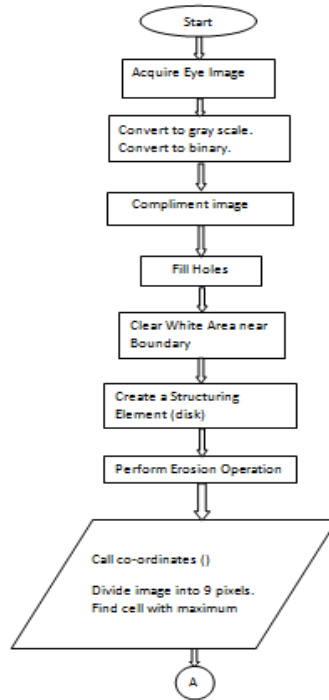
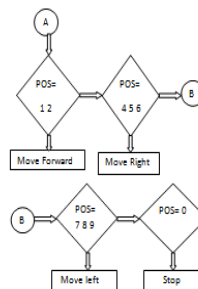
A Webcam Is A Video Camera That Stores The Images In A Real Time To A Personal Computer. A Webcam Is Generally Connected Through Usb Cable. It Typically Consist Of A Lens, An Image Sensor And Supporting Circuitry. Most Of The Webcams Are Capable Of Providing The Resolution At 30 Frames Per Seconds. Support Electronics Read The Image From The Sensor And Transmit It To The Host Computer. Here Webcam Takes The Images And Provides Input For Matlab. The Matlab Processes On The Images And Provides The Output For PsoC Microcontroller

Ir Sensor:

An Infrared Sensor Is An Electronic Instrument I.E. Used To Sense Certain Characteristics Of Its Surrounding By Either Emitting And/Or Detecting Infrared Radiation. Infrared Waves Are Not Visible To Human Eyes. Ir Sensor Is Used To Detect Obstacles In The Moving Are Of Wheelchair.

Working Principal:

The Chair Will Sense The Obstacles In Front Of It And There Will Be Auto Stop, This Obstacle Detection Done Through The Infrared Sensor. Infrared Sensor Is Basically Used For Non-Contact Distance Measurements. It Works On The Principle Of Measuring The Time A Sound Wave Takes To Propagate From The Sensor, To An Object And Back To The Sensor. They Are Generated By A Transmitter And Reflected By The Target. The Returning Waves Are Detected By A Receiver. The Time Delay Is Used To Measure The Distance To The Object. This Sensor Senses The Obstacle In The Way And Stops 30 Cm Before It.

Flow Chart:**Figure 2 Flow Chart****V. Results**

Forward Movement: When We Detect The Position Of Iris Exactly At The Centre I.E. We Get The Pos=1 2 3 Then Chair Will Move In The Forward Direction.

Leftward Movement: When We Detect The Position Of Iris In Left Side I.E. We Get Pos=7 8 9 Then Chair Will Move In the Leftward Direction.

Rightward Movement: When We Detect The Position Of Iris In The Right Side I.E. We Get Pos=4 5 6 Then Chair Will Move In the Rightward Direction.

To Stop The Chair: When We Will Not Detect The Iris I.E. Pos=0 It Means Eyes Are Closed While Capturing The Images Then Chair Will Be Stopped.

Table 1 Wheelchair Movement as Per Iris

Iris Position	Pos	Wheelchair Direction
Centre	1 2 3	Forward
Left Side	7 8 9	Left
Right Side	4 5 6	Right
Not Detect	0 0 0	Stop

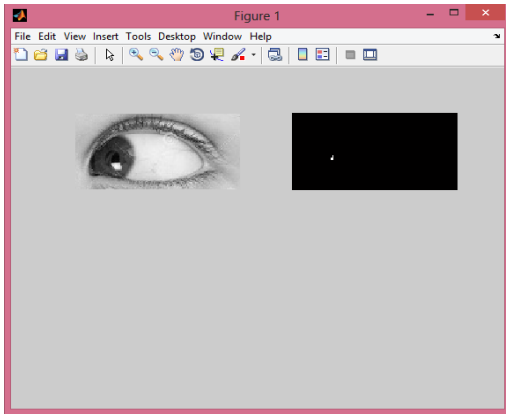


Figure 3 Movement of Wheelchair In Left Direction

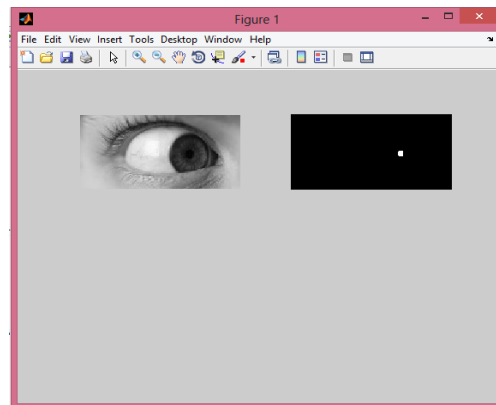


Figure 4 Movement Of Wheelchair In Right Direction

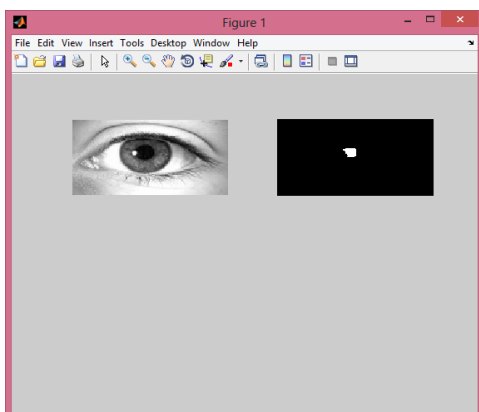


Figure 5 Movement of Wheelchair In Forward Direction

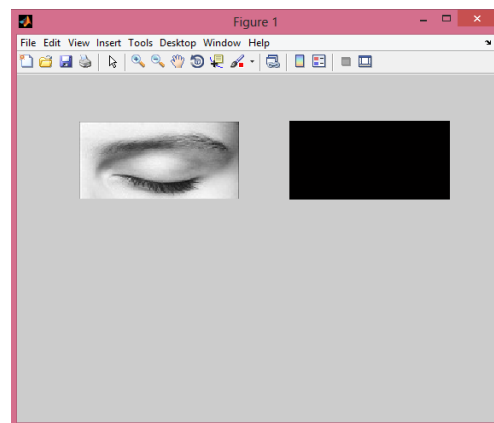


Figure 6 Stop The Wheelchair

VI. Conclusion

This Paper Gives Us A Solution To Provide Mobility To The Physically Handicapped People With The Help Of Their Iris Movements. By Capturing The Images And Performing Proper Operations On It We Can Easily Achieve The Required Output And Take The Decision I.E. Movement Of Left, Right, Forward And Stop. We Can Also Provide The Obstacle Proof Roaming. Using Image Processing We Can Achieve The Better Performance Compare To All The Other Existing Techniques.

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