

Development of Virtual Experiment on Amplitude Modulation

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Abstract:-

The scope of this paper includes development and implementation of virtual lab for amplitude Modulation. The study of amplitude modulation is important in data communications and network. The amplitude modulation experiment can be performed by using the concept of virtual Intelligent SoftLab (VIS). The virtual experiment described here will help students to perform it any time anywhere. The screen shows virtual carrier, modulating and modulated waves and the necessary circuit for studying Amplitude modulation. There is a facility for change of amplitude and frequency of modulating signal. The effect of mixing of carrier and modulating signal is also visible on the screen.

Keywords: - Modulation, SoftLab, Virtual, VIS Model

1. Introduction

Science subjects always have a component of practical. In subject like Physics and Electronics students have to perform a large number of experiments in an academic year. Many times students do not get time to repeat experiments which they have performed during the session. Also many of the laboratories lack in resources to perform experiments in which sophisticated instruments are required. Therefore to provide access to laboratory experiments, anytime anywhere, concept of virtual laboratory is being developed. This virtual laboratory can cater to students at under graduate (UG) and post graduate (PG) levels. Some software's like Mat Lab and Lab View are available for simulation of experiments and for other purposes. However, these software's are generally available only in Institutes/Laboratories and student can use them only during college hours. It is therefore decided to develop software for performing individual experiments virtually on computer screen. In this laboratory an attempt has been made to develop software for electronics experiments from basic to advance level. Basic experiments such as study of characteristics of devices, have been describe else ware [1-2]. Software based on Visual Basic for constructing and virtually performing an experiment on amplitude modulation is virtual environment described in this paper.

2. Modulation

Modulation is defined as a process by which some characteristic usually amplitude, frequency or phase of the voltage of carrier wave is varied in accordance with the instantaneous voltage of some other wave called the modulating signal. The modulating signal is a low frequency signal where as the carrier is of high frequency. In modulation the low frequency (modulating signal) is super imposed on the high frequency (carrier) thereby shifting the low frequency (message) to higher frequency. It is possible to radiate the message through space and therefore known as wireless communication. Fig-1 shows the modulating and carrier waves where as Fig-2 shows the amplitude, frequency and phase modulated waves [3]. In the next section complete amplitude modulation experiment in virtual environment is described so that students can perform and understand the concept of modulation.

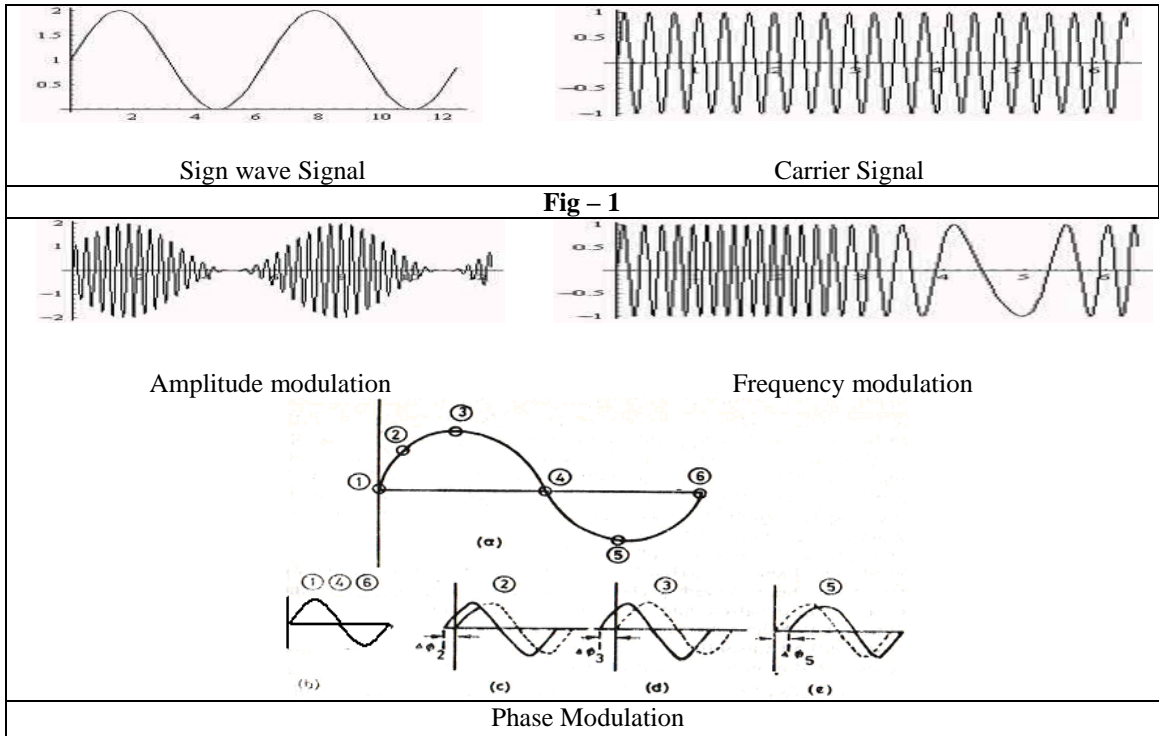


Fig – 2

3. Methodology

Visual Basic is a third generation event-driven programming language and integrated development environment from Microsoft for its COM programming model. VB is also considered as relatively easy to learn and use programming language, because of its graphical features. Visual Basic was derived from BASIC and enables use of graphics user interface, access to database and creation of ActiveX controls and objects. A programmer can put together the component provided with Visual Basic itself to develop an application. The language not only allows programmers to create simple GUI applications, but can also develop complex applications. Programming in VB is a combination of visually arranging component or control on a form, specifying attributes and actions of those components. Visual Basic can create executables (EXE files), ActiveX control or DLL files, but is primarily used to develop Windows applications. The beauty of this model is that it does not require the Database to manage data [5].

4. VIS MODEL

A program is constructed for conduct of Amplitude modulation experiment in VIS in 'VB' such that all the blocks in the model can be fully visualized on the screen. This model also can demonstrate the activities of Amplitude Modulation including circuit connection visually. Inputs accepted through virtual carrier signal generator and modulating signal generator generates Modulated virtual output which is observable on screen. In an experiment, one can provide different amplitude and frequency values for modulating signal and observe modulated signal. This model provides circuit connection facility to user so that the user can practice circuit connection also.

4.1 DESIGN SPECIFICATIONS

An amplitude modulation VIS Model requires virtual sine wave generators, virtual CRO and virtual connection wires. Virtual sine wave generator allowed different setting of amplitude and frequency in both carrier wave signal and modulating wave signal. The virtual instruments required for complete experimental setup like virtual AC supply, carrier wave generator, modulating wave generator, CRO and DC power supply are visible on the screen. With this arrangement modulation from 0% to 100% or more can be very easily studied.

Important screen shots of the experiment which appear on the monitor screen are shown in Fig-3, Fig-4, Fig-5 and Fig-6.

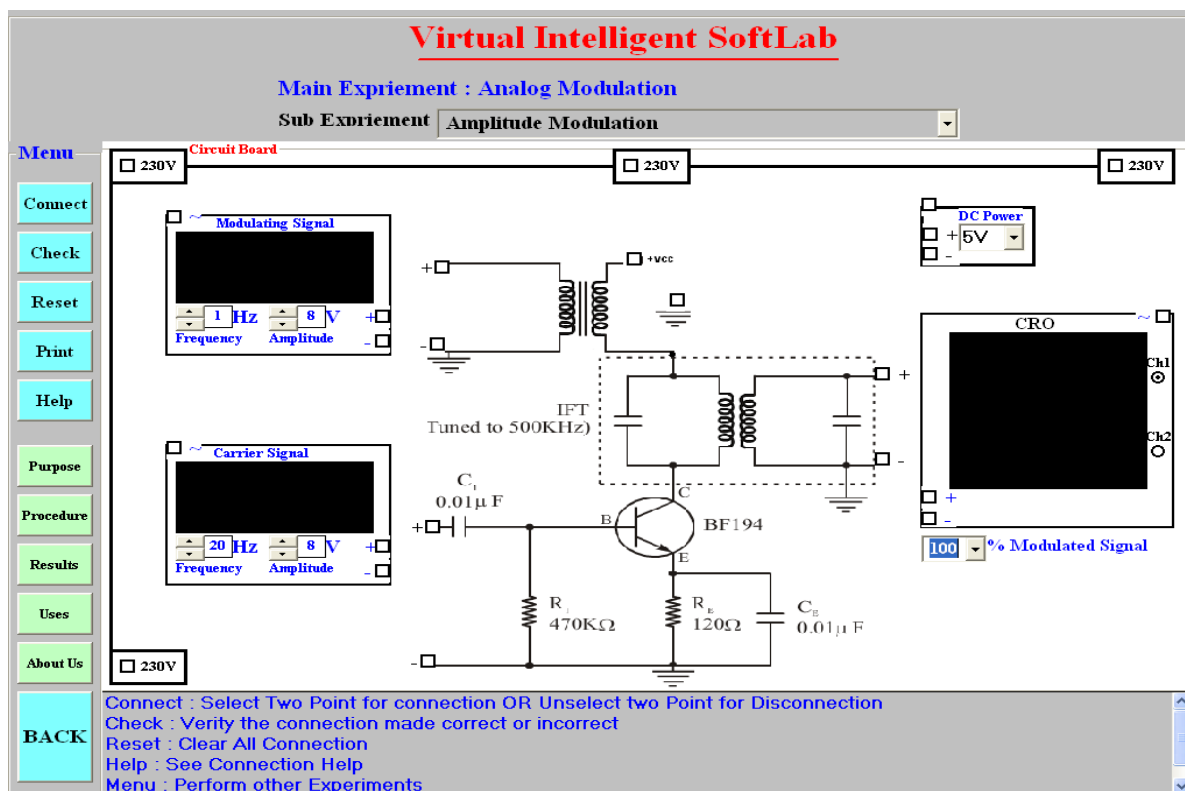


Fig-3: VIS Model before Connection

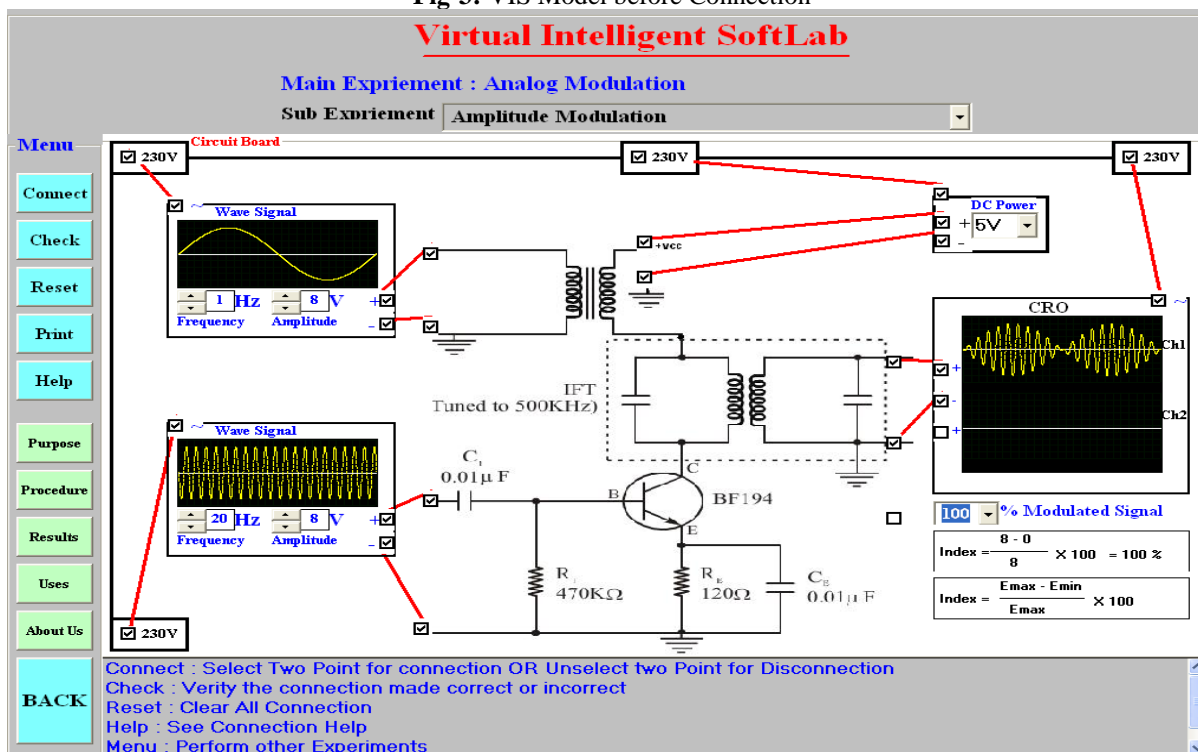


Fig-4: VIS Model 100% Amplitude Modulation

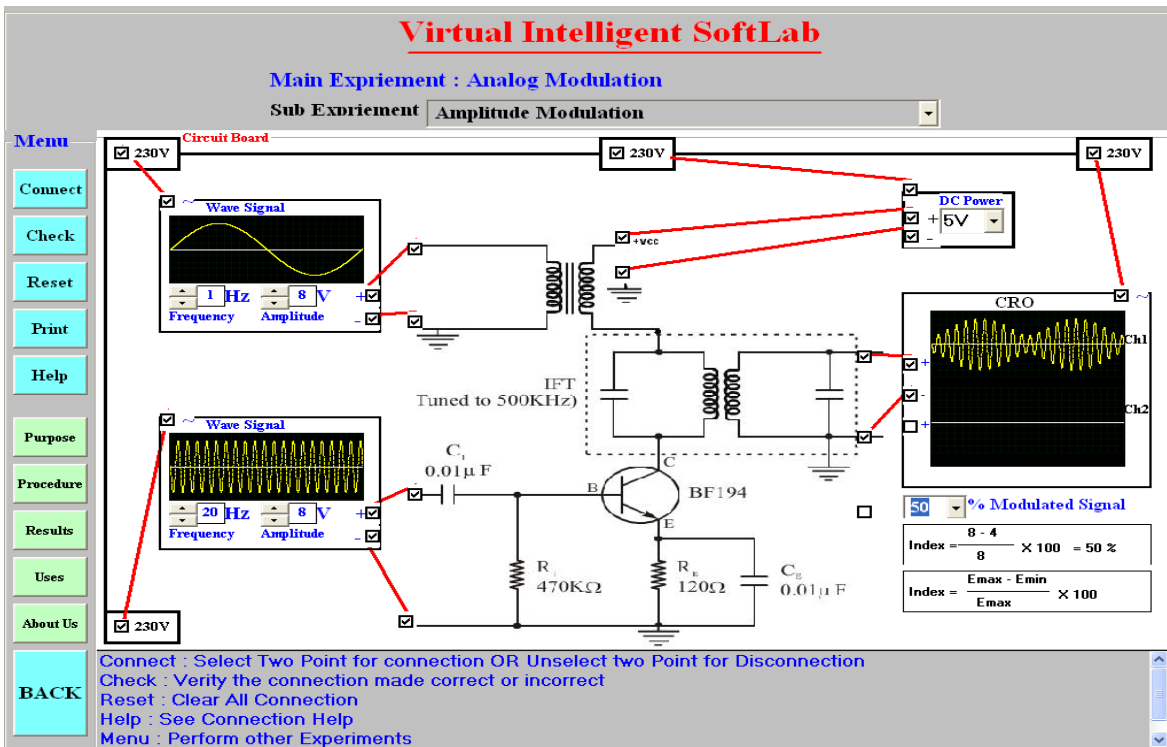


Fig-5: VIS Model 50% Amplitude Modulation

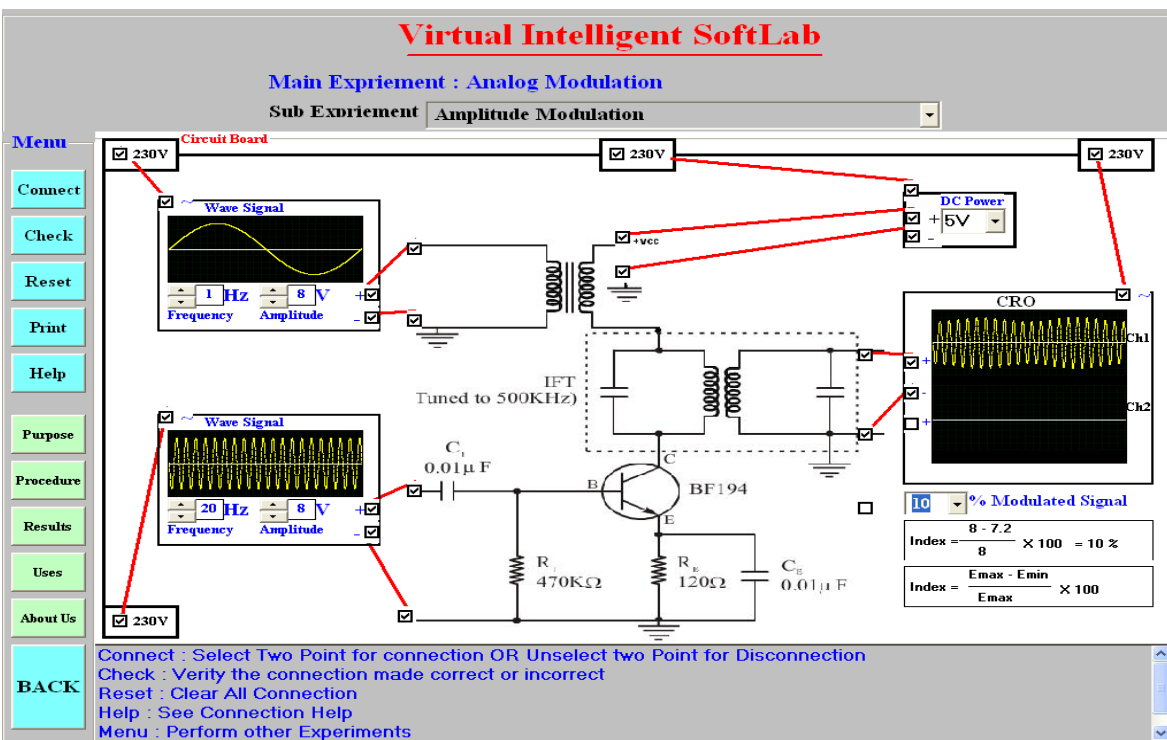


Fig-6: VIS Model 10% Amplitude Modulation

4.2 IMPLEMENTATIONS

To perform the experiment with VIS Model one has to go through the following steps.

Step: 1. Connect AC socket to DC Converter device.

Step: 2. Connect DC power supply to V_{cc} pin.

Step: 3. Connect Ground Socket to Ground Pin.

Step: 4. Connect AC power supply to virtual sine wave generators and CRO.

Step: 5. Change Amplitude and/or frequency and observe modulated waves on CRO.

This model is user friendly. Here, the instructor/student can access the detail procedure to connect the circuit. This procedure includes following steps –

- Select two switches for connection.
- Click the “Check Button” to verify the connection.
- Click the “Reset Button” if the connections are WRONG.
- Click the “Help Button” if you need Connection HELP
- Click the “Menu Button” if you want to perform other Experiments

4.3 RESULTS

Effect of change in amplitude or frequency of modulating signal on modulated signal is observable from no modulation to 100% or above. Actual calculations of % modulation also can be performed from on screen measurements.

5 CONCLUSIONS

SoftLab will help Electronics, Computer Science and Engineering students to perform and practice experiments to improve their understanding of the subject. The design of the VIS model is more effective and realistic as necessary variable inputs and outputs are visible on the monitor screen. This virtual experiment provides practice to students for the ‘touch & feel’ part they have already performed in the laboratory.

Acknowledgement

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Authors Profile



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