Teaching-Learning Process in Engineering using Virtual Instrument based on LABVIEW

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Abstract

The development of undergraduate laboratories is more expensive if a hand-on training approach is considered. Additionally, relatively much inexpensive software can work a standard personal computer (PC) into a virtual lab. The fundamental issues are to set up balance between real and virtual labs to rectify cost related issue while graduating engineers with sufficient practice. This article is useful in a virtual experiment for work of teachers and students in Electronics and Provides a precise and extensive design scheme by which learners can taught engineering experimentation and virtual instrumentation. This virtual experiment platform support classroom teaching using which the teacher can constitute a hi-tech atmosphere, as well as provides exercises and tests self learning of students. A Simulation enriches coaching and enlarges teaching quality. The educational problem is to improve student’s experience of learning Electronics and telecommunication fundamentals using Lab VIEW. It was widely used in the laboratory sessions, to improve students for the project work.

Keywords: E-learning, Lab view, Virtual Instrumentation

1. Introduction

Learning is supported by hands-on activity, especially in the Engineering and technology fields allowing students to learn by their own mistakes and actions to bridge the gap between theory and practical aspect. As engineering is a hands-on field, most engineering results in an ultimate product, it is hard to teach students exclusive of giving them a opportunity to feel the underlying physics [1]. For fast prototype of creating a design, to do study and practical execution of projects, Virtual Instrument Engineering Workbench is a good tool. Now a days Virtual instrumentation is a popular terms that has much changed the idea of conventional instrumentation learning. In engineering education field hands-on training and experimentation are the crucial concern. By means of experiments of students are allowed to observe occurrence, fact, interpretation, and relevant their consideration of the actual world. Comprehensive thought on the part of lab work in learning have query that how to beat a balance among hypothesis and application. Labs can be costly and time-wasting, whereas conceptual learning can be tedious and tricky to comprehend. Since, without the essential understanding of theory, laboratory work can become a wasteful investigation process.

Researchers proposed one solution by means to use instruments similar as Lab VIEW during education of engineering. Lab VIEW can be used to assist students recognize hard thesis and apply these to real world difficulties [1-4] Novel practice and technologies are needed for era
learners to carry out clue elementary concepts of engineering by using electronic brain based consideration and automatic systems [3]. This is the important primary approach to help these needs is virtual instrumentation (VI), it helps to apply portable hardware and customize software to build unclear count scheme. Many virtual instrumentation techniques and different ways to resolve the problem have been proclaimed depend on particular exercise or objective concertgoers [5].

This paper illustrates the work originated by a group of E&TC SIEM that portrayed together for an interactive experience for in Electronics and Telecommunication engineering. The reason to prefer Lab VIEW as the tool is due to its capability to provide interactive experiences students, this is very essential for engineering field.

2. LABVIEW Programming

Virtual Instrumentation (VI) can used for the actual instruments labs, as well as for application building, which imitate actual devices and operating instruments, for modeling and animation of the real physical experiment. A vital and noteworthy feature of building View, can be used to improve productive applications in the teaching learning course of action. It give the essential progress tools for number of applications encompassing data heap, instrument authority, counts, investigation and data exhibit, etc The main aim of LabView represents the design of virtual instruments. Labview is a system depends on the data flow theory. Such system resides performable nodes that perform only when they obtain all important input data and produce output data instantaneously when they go into performance. [6,7]. LabVIEW (short for Laboratory Virtual Instrumentation Engineering Workbench) is a graphical programming language that uses icon and wires connection which is widely used in industry Compare to text based programming. In LabVIEW, a Program is named as Virtual Instrument which has two fragment: Block Diagram (BD) and Front Panel (FP). Block Diagram gives imaginal information of data flow paths among processing blocks. Front Panel gives Graphical User Interface (GUI) which allows modification of various parameters connected with Block Diagram as a VI runs. It is a programming language which avail dataflow programming approach. The learning time is significantly less for one who has some background of basic programming. Also the boundless documentation and massive amount of in-built VI are existing that can be use and exploit in addition. LABVIEW software is a appropriate choice for teaching/learning laboratory based work [2]. The non-programmers can easily build programs as it provides the graphical way, in which simple drag and drop of the lab equipment with which they are formerly habitual.

![Lab VIEW programming environment](image)

Fig. 1. Lab VIEW programming environment show a) Front Panel and b) block diagram

3. LABVIEW-Based Virtual Laboratories

The aim is to study the fundamental concepts of Electronic including signal processing, basic
digital electronics, analog Communication, and virtual instrumentation.

3.1 Signal Processing
In this part of the course, the students learn how to process and analyze data. For example, the virtual instrument front panel in Figure Discrete Fourier Transform and sampling theory, and the effects of signal aliasing. The sampling experiment is an excellent way to teach students sampling theory by sampling at different frequencies; students can see the effects of aliasing in their signal and their FFT plot.

3.2 Analog communication
Engineering depends on only computer counterfeit only, without interactive training, it’s hard to provide practical experience. Students will recall what they learned about modulation when the modulation techniques are taught on virtual as well as real platforms. One way of achieving this aim is to use National Instruments learning Lab Virtual Instrumentation Suite (NI-ELVIS) and LabVIEW software. It turn on the visualization of elementary analog-modulation techniques. A user-defined message signal and a modulated carrier signal are displayed in the time or the frequency domain. [3, 8] A LabVIEW Virtual Instrument (VI) file was developed to realize a amplitude modulator with the main image diagram and front panel shown in Figure 4.

Conclusion
This paper reviews the capability of using LabVIEW to learn the foundational concepts of Electronic and Telecommunication Engineering. The adoption of LabVIEW to develop engineering experimentation and virtual instrumentation has been truly successful. It gives an useful method to attain investigational results, add additional principles to experiments, and allows students to target on the theory and practical facet of the
measures. The main goal is to lessen the monotonous and time-consuming aspects of experimenting, such as devise experiment descriptions, documenting results of simulations, measurements, and setting of instrumentation. The VI based way appreciably enlarged the effectiveness of educating and investigation in terms of learners enthusiasm, effortlessness programming, and instrument relatedness with actual globe, simplicity of modification, less generation duration and lower the cost of system. The exploitation of the virtual lab based experiment using LabVIEW in teaching assists in class teaching, as well as provides exercise for students to do after class using virtual experiment platform, which will improve their understanding of the theories and their practical abilities.

References


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