Virtual Instrumentation

R. V. Nirubhanjali
Dept of ECE- Saranathan College of Eng

S. Soundharya
Dept of ECE- Saranathan College of Eng

Abstract:- **An instrument is a device used to collect data, process it and display information. Virtual Instrumentation is an exposure to concepts in PC-based instrumentation including principles of graphic system design and concepts in data acquisition to develop simple to complex virtual instruments using NI Lab view and NI hardware. It is mostly used to make customized software with the help of virtual programming software like lab VIEW, where you can program virtually by means of placing virtual things like box and shapes instead of lines of coding. In the means of hardware it used to measure the changes in a system. VI is a combination of customized software to measure the changes in a system with help of modular hardware. The rapid adoption of the PC in the last 20 years catalyzed a revolution in instrument for test, measurement, and automation. One major development resulting from the ubiquity of the PC is the concept of virtual instruments, which offer several benefits to engineers and scientists who require increased productivity, accuracy and performance.**

HISTORICAL PERSPECTIVE:

- Analog measurement device
- Data acquisition and processing devices
- Digital processing based on general purpose computing platform.

INTRODUCTION:

Virtual instrumentation is the use of customizable software and modular measurement hardware to create user-defined measurement systems, called virtual instruments. A virtual instrument consists of an industry-standard computer or workstation equipped with powerful application software, cost effective hardware such as plug in boards, and the driver software, which together perform the functions of traditional instruments. Virtual instruments represent a fundamental shift from traditional hardware-centred instrumentation systems to software-centred systems that exploit the computing power, productivity, display, and connectivity capabilities of popular desktop computers and workstations.

HOW VIRTUAL INSTRUMENTS ARE ADVANTEGEOUS THAN TRADTIONAL INSTRUMENTS?

Virtual instruments are user defined, software is the key, and it is low cost and reusable, open flexible functionality leveraging of familiar computer technology, application – oriented system with connectivity to networks, peripherals and applications. Software minimizes development and maintenance costs.wheareas traditional instruments are vendor defined, function specific, hardware based, and expensive, high development and maintenance costs. Traditional hardware instrumentation systems are made up of pre-defined hardware components, such as digital multimeters and oscilloscopes that are completely specific to their stimulus, analysis, or measurement function. Because of their hard-coded function, these systems are more limited in their versatility than virtual instrumentation Systems. The primary difference between hardware instrumentation and virtual instrumentation is that software is used to replace a large amount of hardware. The software enables complex and expensive hardware to be replaced by already purchased computer hardware ADC can act as a hardware complement of a virtual oscilloscope, potentiostat enables frequency response acquisition and analysis in electrochemical impedance spectroscopy with virtual instrumentation. Leveraging commercially available technologies, such as the PC and the analog-to-digital converter, virtual instrumentation has grown significantly since its inception in the late 1970s. Additionally, software packages like National Instruments' Lab VIEW and other graphical programming languages helped grow adoption by making it easier for non-programmers to develop systems. The newly updated technology called “Hard virtual instrumentation” is developed by some companies. It is said that with this technology the execution of the software is done by the hardware itself which can help in fast real time processing. Virtual instrumentation (VI) provides an ideal platform for developing instructional curriculum and conducting scientific research. In an instructional laboratory course, students perform various experiments that combine measurements, automation, and control. Tools or systems used in these situations must be flexible and adaptable.VI is rapidly replacing classical analog as well as digital instrumentation systems owing to the availability of high performance microprocessors based PCs, fast Analog-to-Digital Converters (ADCs) and sophisticated data communication technology. Instead of relying on commercially available expensive hardware, a low-cost self-developed DAQ card is employed. The elaboration of the idea is carried out by designing a VI based DC drive and a thermal system. Modelling, PID controller and user-interface development is presented for both examples. The positive results of this study establish the utility of virtual instrumentation especially for control applications.

ADVANTAGES OF VI:

- Performance
- Platform independent nature
- Flexibility
- Low cost
- Plug in and networked hardware
- Minimizing set up and configuration time costs
- Lowering the cost of software and hardware
- Economic

APPLICATIONS:

The Development of Virtual Instrument Technology With the development of science and technology, traditional instruments can't satisfy the requirement of industrial production and experimental research. Virtual instrument can be widely used in communication, electronic measurements, mechanical engineering, biological medical and many situations which require scientific analysis with high performance equipment for its intelligent, automation, flexibility. Developments of virtual instrument depend on the computer, software, high quality A/D acquisition card and regulate amplifiers, so computer hardware and software make virtual instrument mixed with high-tech together closely. Virtual instrument not only widely used in industry, but also in experimental teaching for short development and maintenance time, easy extension and integration, which has been a new means of teaching. It became a developing tendency to deduce physics experiment together with the multimedia teaching and virtual instrument technology, and walked into the laboratory and electronic technology class slowly. Students can complete various electronic instrument operations by the Computer and network assistance to improve learning efficiency and need not worry about damaging experimental instruments. It also can bring students broad vision and high-tech learning atmosphere. At present, virtual instrument mainly developed to the following directions: Hanging-outside virtual instrument, PXI-type integrated virtual instrument, networked virtual instrument. Hanging-outside virtual instrument could effectively prevent measured signal and computer form mutual interference to make test result accurate and reliable. Networked virtual instrument made test message and result sharable and even could control experiment facility in a long distance, so it was hopefully used to solve problems of experiment in distance education. Next generation virtual instrument tools need to include networking technology for quick and easy integration of Bluetooth, wireless Ethernet, and other standards.

CONCLUSION**:**

Virtual instruments are fuelled by ever advancing computer technology and offer you the power to create and define your own system based on an open frame work. This concept is not only ensures that your work will be usable in the future but also provides the flexibility to adapt and extend as needs change. Thus, virtual instrumentation is more effective, flexible and efficient as it is user friendly, it simplifies the measurement procedures with visual or graphical based programming. All operations of the test and measurement procedure like control of information, display and analysis of acquired data, data management such as archiving, printing, internet published in the software. Thus a virtual instrument defines its specific function through software programming and more development in this will simplify the analysis of instruments.