

E1-25: Building low cost multi-function virtual instruments for physics research

HTTM Fernando and DUJ Sonnadara*

Department of Physics, University of Colombo

A virtual instrument is a combination of hardware and software elements that has the functionality of a stand-alone instrument. However, unlike the traditional instruments which are designed to carry out a specific task, virtual instruments allow the user to define the functionality of the instrument by changing the software elements.

A simple virtual instrument can be created by constructing an ADC interfaced to the computer through the parallel port or the serial port and by writing the control system software. It can also be done by constructing special cards that can be plugged into the PC bus directly. Both these methods have their pros and cons and require the construction of the necessary electronic circuits.

In this study we concentrated on building virtual instruments using standard Sound Blaster cards that come as a part of a modern PC. For example, a PC with a Sound Blaster card can easily be converted to a Digital Storage Oscilloscope that has an approximate bandwidth of 20 kHz and a resolution of 0.002% simply by writing the control system software. We have already developed a software package that can convert a PC with a Sound Blaster card to a Digital Storage Oscilloscope.

Our studies show that it is very practical to create low cost multi-function virtual instruments using Sound Blaster cards. In particular, the flexibility of using the same PC and card to create many types of virtual instruments such as Digital Storage Oscilloscopes, Spectrum Analyzers, Digital Voltmeters, Data Loggers etc, would certainly be more economical and meaningful in the long run.

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