

## **Design and development of an automated, portable and handheld tablet personal computer-base data acquisition system for monitoring electromyography signals during rehabilitation**

### **Abstract**

This article describes the design of a robust, inexpensive, easy-to-use, small, and portable online electromyography acquisition system for monitoring electromyography signals during rehabilitation. This single-channel (one-muscle) system was connected via the universal serial bus port to a programmable Windows™ operating system handheld tablet personal computer for storage and analysis of the data by the end user. The raw electromyography signals were amplified in order to convert them to an observable scale. The inherent noise of 50 Hz (Malaysia) from power lines electromagnetic interference was then eliminated using a single-hybrid IC notch filter. These signals were sampled by a signal processing module and converted into 24-bit digital data. An algorithm was developed and programmed to transmit the digital data to the computer, where it was reassembled and displayed in the computer using software. Finally, the following device was furnished with the graphical user interface to display the online muscle strength streaming signal in a handheld tablet personal computer. This battery-operated system was tested on the biceps brachii muscles of 20 healthy subjects, and the results were compared to those obtained with a commercial single-channel (one-muscle) electromyography acquisition system. The results obtained using the developed device when compared to those obtained from a commercially available physiological signal monitoring system for activities involving muscle contractions were found to be comparable (the comparison of various statistical parameters) between male and female subjects. In addition, the key advantage of this developed system over the conventional desktop personal computer-based acquisition systems is its portability due to the use of a tablet personal computer in which the results are accessible graphically as well as stored in text (comma-separated value) form.

### **Keywords**

Data acquisition; Electromyography; Handheld; Portable; Rehabilitation; Tablet personal computer; Biceps brachii