Design of Wireless Variable Gesture Control For Mobile Devices

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Abstract: -   Electromyography (EMG) is a technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using an instrument called an electromyograph, to produce a record called an electromyogram. An electromyograph detects the electrical potential generated by muscle cell when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, or recruitment order or to analyze the biomechanics of human or animal movement. In the proposed method we are using sensors instead of camera to sense and identify the gestures. Here we are using Accelerometers and surface electromyography (SEMG) sensors. These two sensors provide two potential technologies for gesture sensing. Accelerometers can measure accelerations (ACC) from vibrations and the gravity; therefore they are good at capturing noticeable, large-scale gestures.

Index Terms-- EMG (Electromyography), Accelerometer, muscles, gestures.

INTRODUCTION

Sensing and identifying gestures are two crucial issues to realize gestural user interfaces. The use of camera is an early developed technology to sense gestures, but it has not been applied in most mobile cases due to challenging problems such as changing light and background. Accelerometers and surface electromyography (SEMG) sensors provide another two potential technologies for gesture sensing. Accelerometers can measure accelerations (ACC) from vibrations and the gravity; therefore, they are good at capturing noticeable, large-scale gestures.
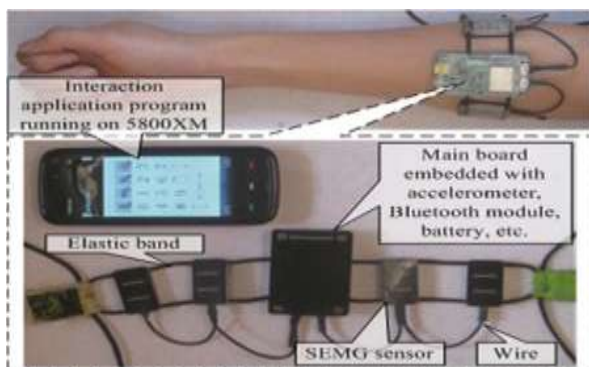

Fig. 1.Gesture-based interaction prototype with the gesture-capturing device designed to be worn around the for e arm.

SEMG signals, which indicate the activities of related muscles during a gesture execution, have advantages in
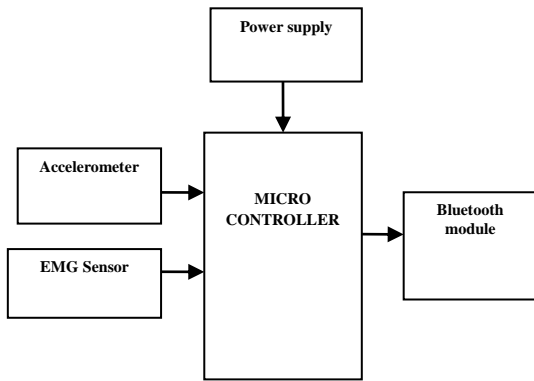
capturing fine motions such as wrist and finger movements and can be utilized to realize human–computer interfaces. For example, a commercial gesture input device named MYO is a wireless armband with several SEMG sensors designed for interactions. Various kinds of interaction solutions can be developed using its programming interface.

Since both accelerometers and SEMG sensors have their own advantages in capturing hand gestures, the combination of both sensing approaches may improve the performance of hand gesture recognition. Although studies that utilized both SEMG and ACC signals, few combined them to realize a gesture-based interaction system. In our pilot studies, a series of promising applications with gestural interfaces relying on portable ACC and SEMG sensors were developed, including sign language recognition and human–computer interaction. We further designed a wearable gesture-capturing device and then realized a gesture-based interface for a mobile phone to demonstrate the feasibility of gesture-based interaction in the mobile application. In that preliminary work, SEMG and ACC signals were not actually fused together in that interface, and only nine gestures were supported.

II.

PROPOSED SYSTEM

In the proposed method, SEMG signals, which indicate the activities of related muscles during a gesture execution, have advantages in capturing fine motions such as wrist and finger movements and can be utilized to realize human–computer interfaces.

At user's wrist (Transmitter):

EMG Sensor:

FIG. 2

Example of Armband with Integral EMG Sensor Nodes for Implementing the Wearable Electromyography Based Controller

At Receiver:

Here Accelerometer, SEMG sensor, and Bluetooth are connected to micro controller. The total system is placed at user's wrist. Whenever gesture is generated, that can be identified by sensors and the controller will send the information to Bluetooth module. Another Bluetooth will receive the information and send to ARM controller. Here ARM board acts as mobile device. Based on gesture recognition we can control the mobile device applications like playing music, displaying video, opening message icon etc.

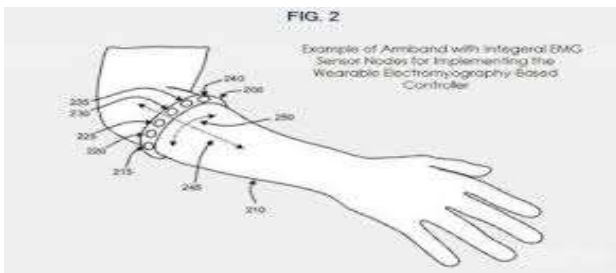### III.HARDWARE IMPLEMENTATION

A. RASPBERRY PI BOARD

The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers.
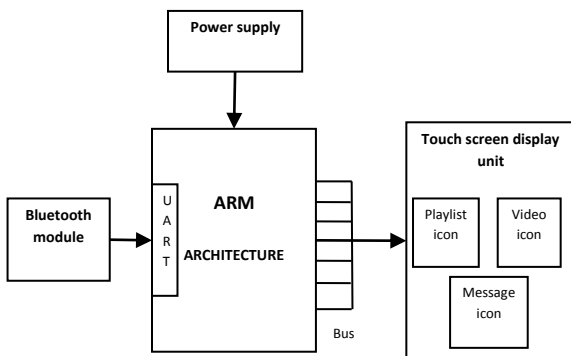

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.
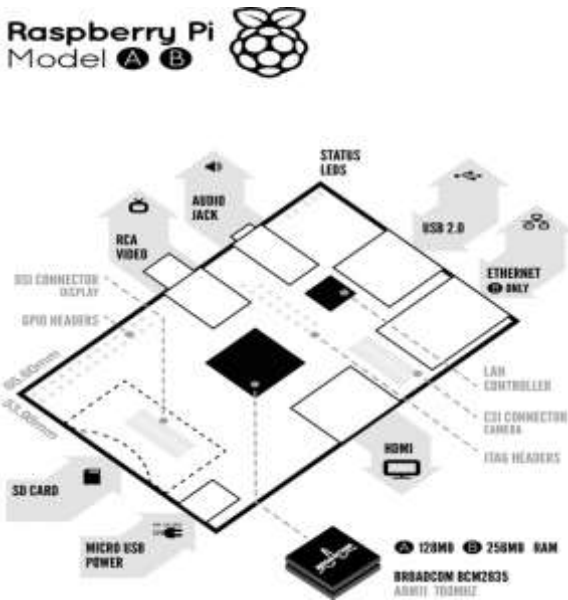
Fig2. Board features

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

B. TFT display unit

TFT stands for Thin Film Transistor, and is a type of technology used to improve the image quality of an LCD. Each pixel on a TFT-LCD has its own transistor on the glass itself, which offers more control over the images and colors that it renders.

While TFT-LCDs can deliver sharp images, they also tend to offer relatively poor viewing angles, meaning they look best when viewed head-on. If you view a TFT-LCD from the side, it can be difficult to see. TFT-LCDs also consume more power than other types of cell phone displays.

C. EMG Sensor

Electromyography, or **EMG**, is a medical technique for measuring muscle response to nervous stimulation. EMG is performed using an instrument called an electromyograph, to produce a record called an electromyogram. An electromyograph detects the electrical potential generated by muscle cells when these cells contract. EMG can be performed with needle electrodes, in order to study very localized potentials, or with surface electrodes to study larger muscle (group) contractions (known as surface EMG or SEMG).

Measurements are often taken with Ag/AgCl temporary electrodes, or with metal electrodes into which conductive/adhesive gel is injected. The surface of the skin should be shorn and abraised lightly to ensure high conductivity. Dead, dry skin reduces the effectiveness of the induced EMG signal. Three electrodes are suggested for a fully-differential setup: two difference electrodes and a

ground electrode. The 'difference' electrodes are placed on either side of the muscle under study. The ground electrode should be placed on the skin above a non-muscled portion of the body, near the difference electrodes. For example, when measuring the surface potential of the calf muscle, the ground electrode would be placed on the knee.

IV. SOFTWARE REQUIREMENTS

A. Linux Operating System:

Linux or GNU/Linux is a free and open source software operating system for computers. The operating system is a collection of the basic instructions that tell the electronic parts of the computer what to do and how to work. Free and open source software (FOSS) means that everyone has the freedom to use it, see how it works, and changes it. There is a lot of software for Linux, and since Linux is free software it means that none of the software will put any license restrictions on users. This is one of the reasons why many people like to use Linux.

A Linux-based system is a modular Unix-like operating system. It derives much of its basic design from principles established in UNIX during the 1970s and 1980s. Such a system uses a monolithic kernel, the Linux kernel, which handles process control, networking, and peripheral and file system access. Device drivers are either integrated directly with the kernel or added as modules loaded while the system is running.
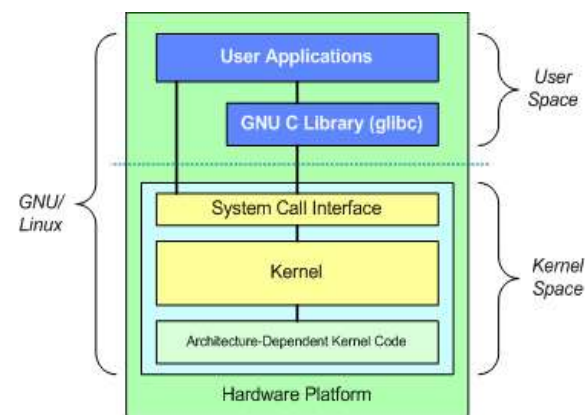

Fig7. Architecture of Linux Operating System

B. Qt for Embedded Linux:

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface (GUI) (in which cases Qt is classified as a widget toolkit), and also used for developing non-GUI programs such as command-line tools and consoles for servers. Qt uses standard C++ but makes extensive use of a special code generator (called the Meta

Object Compiler, or moc) together with several macros to enrich the language. Qt can also be used in several other programming languages via language bindings. It runs on the major desktop platforms and some of the mobile platforms. Non-GUI features include SQL database access, XML parsing, thread management, network support, and a unified cross-platform application programming interface for file handling. It has extensive internationalization support.

V.RESULT
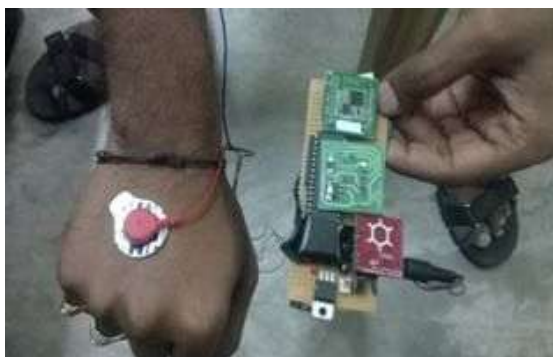
VI.CONCLUSION

This Paper "**Design Of Wireless Variable Gesture Control For Mobile Devices**" has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced Raspberry pi board and with the help of growing technology this paper has been successfully implemented.

VII.REFERENCES

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