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Biometric Authentication Using Mouse Gesture Dynamics

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Abstract: ***Highly interaction in human machine in daily lives has made user interaction progressively very important. Expansion of sensor based advanced technology sophisticated human force and stress in electronic circuits has been greatly reduced the weight and area of consumer electronics products such as smart laptop controls, PC based automation systems helpful for physically challenged. During the movement controls like cursor, mouse operations for computer interaction. The system helps to recognize the work of miniature accelerometer based recognition system which acknowledges hand gestures or motions. MEMS accelerometer measures the acceleration of the signal in three co-ordinates such as x-axis, y-axis, and z-axis. To capture the hand motions online, the general MEMS sensor which can be operated without any external reference and limitation in working conditions are used. In this paper we propose a completely automated controlled PC using Zigbee and MEMS based technology. We can control PC by using MEMS instead of using mouse by interfacing with an ARM-11 Raspberry Pi processor. There is no need of a person to sit in front of PC it can be controlled through some distance by using wireless technology called Zigbee.***

Index terms: ***Raspberry Pi Processor, Zigbee modules, Gesture recognition (MEMS).***

I. INTRODUCTION:

The hunger for automation brought many revolutions in the existing technologies. One among the technologies, which had greater developments, is the MEMS Accelerometer sensor based on embedded technology and applications designing. These had greater importance than any other technologies due its user-friendly nature. An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites.

The hardware and all the software in the system are available to, and extensible by application programmers. Based on performance, functionality, requirement the embedded systems are divided into three categories:

(i) Stand Alone Embedded System:

These systems takes the input in the form of electrical signals from transducers or commands from human beings such as pressing of a button etc.., process them and produces desired output. This entire process of taking input, processing it and giving output is done in standalone mode. Such embedded systems comes under stand alone embedded systems.

(ii) Real-time embedded systems:

Embedded systems which are used to perform a specific task or operation in a specific time period

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those systems are called as real-time embedded systems. There are two types of real-time embedded systems.

- Hard Real-time embedded systems: These embedded systems follow an absolute dead line time period i.e.., if the tasking is not done in a particular time period then there is a cause of damage to the entire equipment.
- Soft Real Time embedded systems: These embedded systems follow a relative dead line time period i.e.., if the task is not done in a particular time that will not cause damage to the equipment.

(iii) Network communication embedded systems:

A wide range network interfacing communication is provided by using embedded systems.

Fig.1 Network communication embedded systems

II. RELATED WORK:

Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. This project makes use of an onboard computer, which is commonly termed as **Raspberry Pi** processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used.

Aforementioned identification or recognition process using raspberry pi processor will change slightly between different products and systems. These Standard systems are comprised of a MEMS which is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt and makes use of the accelerometer to control the mouse movement of the computer depending on tilt. For example if the tilt is to the right side then the cursor moves towards right direction, for the left tilt is to the left side, upward to the cursor direction movements towards upwards, downward to the cursor direction movement towards down. Holding the cursor with delay can operate click operation of the mouse using MEMES sensor. To perform this task, **Raspberry Pi** processor is programmed using embedded 'Linux'.

Linux is a Unix-like computer operating system assembled under the model of free and open source software development and distribution. The defining component of Linux is the Linux kernel, an operating system. The Linux Standard Base (LSB) is a joint project by several Linux distributions and is based on the POSIX specification, the Single UNIX Specification, and several other open standards, but extends them in certain areas.

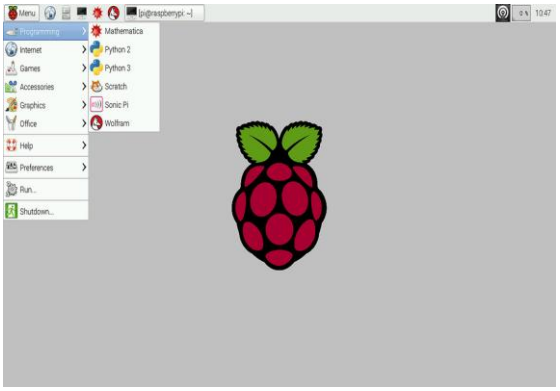

Fig.2 Linux Operating system for Programming

The present system uses an onboard mini computer named as ARM1176JZF-S 700 MHz processor which consists of number of input and output ports, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. The input and output port of the micro processor are interfaced with different input and output modules depending on the requirements. The current system uses USB camera as input module interfaced with the

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arm-11 processor, and the DC motor operation for toll gate open or close and buzzer alarming unit as output modules. In other words BCM2835 system on a chip acts as a communication medium for all the modules involved in the project.

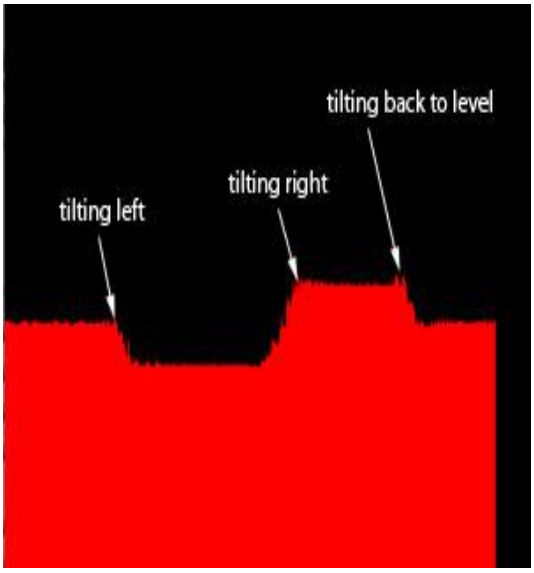
III. PROPOSED METHODOLOGY:

Accelerometers can be used to effectively translate finger and hand gestures into computer interpreted signals. Integrating a single chip wireless solution with a MEMS accelerometer would yield an autonomous device small enough to apply to the fingernails because of their small size and weight. Accelerometers are attached to the fingertips and back of the hand. Arrows on the hand show the location of accelerometers and their sensitive directions. The sensitive direction of the accelerometer is in the plane of the hand. Micro-electromechanical systems (MEMS) are free scale‟s enabling technology for acceleration and pressure sensors. MEMS based sensor products provide an interface that can sense, process or control the surrounding environment. MEMS-based sensors are a class of devices that builds very small electrical and mechanical components on a single chip. MEMS-based sensors are a crucial component in automotive electronics, medical equipment, hard disk drives, computer peripherals, wireless devices and smart portable electronics such as cell phones and PDAs. MEMS technology provides the following advantages: cost-efficiency, low power, miniaturization, high performance, and integration. Functionality can be integrated on the same silicon or in the same package, which reduces the component count. This contributes to overall cost savings.

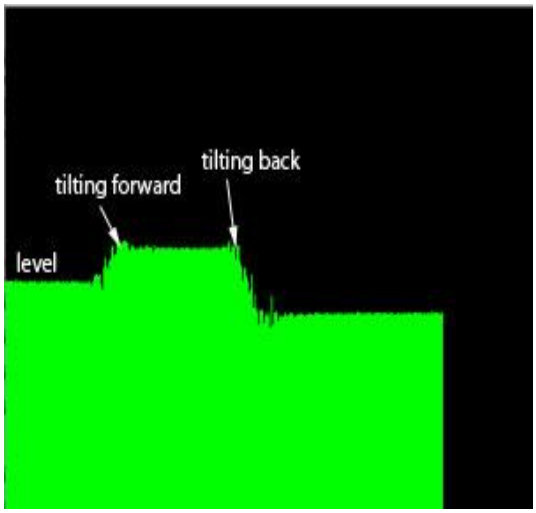
Parts list:

- MMA7260Q accelerometer on Sparkfun breakout board
- MIC29150-3.3BT 3.3V voltage regulator
- 2 - 10Kohm 0.25-watt resistors
- 2 - 1N5226B-T 3.3V zenar diodes

This graph shows the X axis. The accelerometer starts level, and then is tilted to the left, then to the right, then level again:



This graph shows the Y axis. The accelerometer starts level, and then is tilted forward, then back, then level again:



This graph shows the Z axis. The accelerometer is kept level, but raised up in a quick motion, then lowered quickly. Moving up produces a sudden increase in force (and voltage) followed by a sudden decrease when the movement's stopped, then finally the voltage levels out again. Moving down has the opposite effect.

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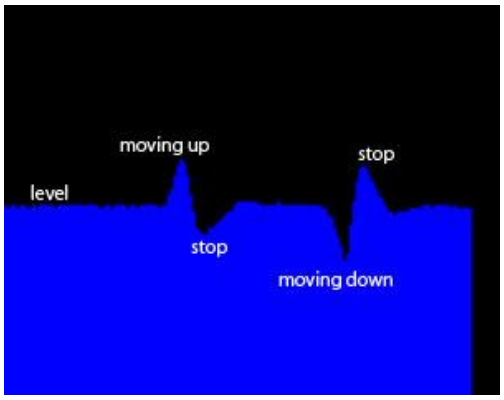

In this paper we are presented MMA7260Q based PC controlling with wireless zigbee technology using ARM1176JZF-S 700 MHz processor. The device which is able to perform the task is a Raspberry Pi processor.

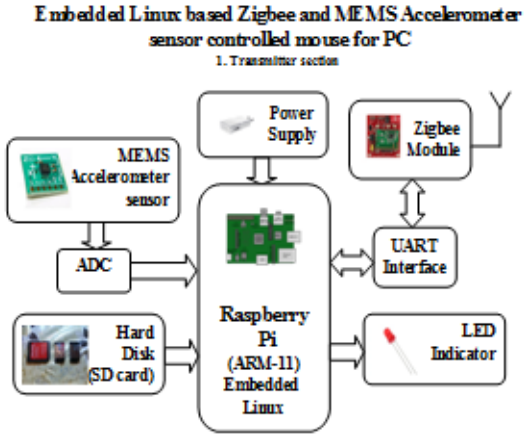

Fig 3.Block diagram of Transmitter section of Embedded Linux based Zigbee and MEMS Accelerometer sensor controlled mouse for PC

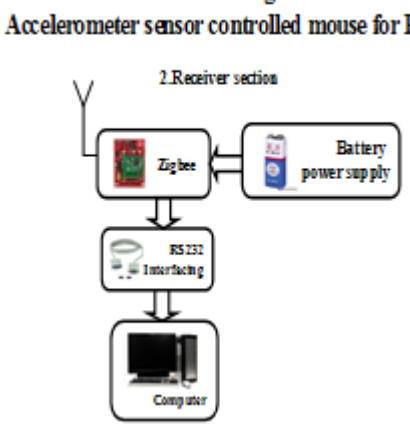

Fig 4.Block diagram of Receiver section of Embedded Linux based Zigbee and MEMS Accelerometer sensor controlled mouse for PC

III. HARDWARE DESIGN FOR PROPOSED SYSTEM:

In the Proposed Gesture recognition based mouse controlling for PC system we used the **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. 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 long-term storage.

Fig.5 Raspberry pi processor

Wireless technology used in the proposed system: - Zigbee is a standard for embedded application has been ratified in late 2004 under IEEE 802.15.4 wireless networking standard protocols. The module Zigbee established set of specifications for wireless personal area network. This Zigbee technology is a bidirectional wireless communication technology for short distance, low power consumption, low cost, low complexity, and also low data rate mainly we will use in automatic control. Mainly it works 2.4GHz ISM band with 20~250kbit/s data rate, the transmission range is 100m ~1.5km. Webcams are known for their low manufacturing cost and flexibility, making them the lowest cost form of video telephony.

In the proposed system we make use of MEMS technology and one **Raspberry Pi** processor, along

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with zigbee module at the user end. MEMS sensor is with the user hand when the user tilts hand then that relevant signal will be send to converter and that signal received by the **Raspberry Pi** processor.

The device consists of a **Raspberry Pi** processor, which is interfaced with the input and output modules, the processor acts as an intermediate medium between both of them. The input module is nothing but a MEMS sensor, which takes the input from the user by tilting and provides the same to the Raspberry Pi processor then the data is transmitted through Zigbee. At the receiving end data is decoded by the receivers Zigbee and this data is fed to the PC through serial communication port. This serial data is read using a small software application at the PC end and respective applications are handled.

IV CONCLUSION:

The existing Gesture recognition system of mouse controlling for PC is an Integrating feature of all the hardware components been used and developed in it with Arm-11 Raspberry pi processor. The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for an automatic license plate recognition system has been designed perfectly. Secondly, using highly advanced IC's like ARM1176JZF-S 700 MHz processor, Linux operating system technology with the help of growing technology, the project has been successfully implemented with a unique idea.

Thus the project has been successfully designed and tested. This system can be extend the wireless distance by using high efficiency WIFI module for data transmission from sensor unit to the PC for future extension. The proposed model can also be added with hand written recognition using MATLAB and MEMS sensor. An acknowledgement of the operations which are being performed to PC can be given by using GSM modem from any where in the world.

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