MEMS ACCELEROMETER BASED PASSWORD RECOGNITION SYSTEM USING GSM

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In this project, Motion Controlled Password Recognition system using MEMS accelerometer is implemented using embedded microcontroller. MEMS accelerometer can sense motion in 3 axes (X, Y and Z). Microcontroller analyzes whether any motion is occurring and in the absence of a motion for a predetermined duration, forces the system to go into a low-power mode. The user can assign a predetermined password by fixed set of motions as decided by them. Once the Microcontroller senses any motion, it uses the GSM modem to send the random number which is generated in it. User receives the sms and enters the random number in keypad. Controller analyzes the motion pattern of the user and provided authorized random number. If both the parameters are matched, the lock will be unlocked.

Keywords: Accelerometer, Keypad, Password Recognition, GSM Modem

INTRODUCTION

The loss of materials and equipment's due to theft is currently a massive problem in most of the firms. Theft can be significantly reduced through proactive management techniques that emphasize the implementation of rigorous project-specific security programs. This paper presents an advanced authentication based on motion of the system. Unlike most of the previous authentication like biometric, cards to swipe it’s entirely different and more reliable. Using machine motion techniques, in our approach logical patterns are obtained from physical sensor attached to the system.

SYSTEM ANALYSIS

1. Text Based Password Management is simple and easy to break.
2. Voice Based recognition is not accurate.
3. Biometric Based Password Recognition is too expensive. Above type of password system are not more secured one so my password are assigned to motion to system. User can provide the password by predetermined and using correct motion then only recognize that correct motion passwords. Compare to other security system, it has two security methods these are text based and then motion based security. Main advantage of this system is
complex to break and cheaper than biometric solution.

**Existing System**
Existing systems are text based password management and voice based recognition and biometric based password recognition.

**Disadvantage of Existing System**
i. Text Based Password Management is too simple, easy to break.
ii. Voice Based recognition is not accurate.
iii. Biometric Based Password Recognition is too expensive

**Proposing System**
Motion controlled password system. User can provide the password by predetermined gestures

**Advantages**
i. Complex – Not easy to break.
ii. Accurate – Recognition rate is accurate.
iii. Less Expensive – Cheaper than biometric Solution.

**SYSTEM SPECIFICATION**

**Hardware Requirement**

**MEMS Sensor**
The ADXL330 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

**Embedded Microcontroller Unit (PIC16F877A)**
This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip’s powerful PIC architecture into an 40-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. PIC16F877A features 256 bytes of EEPROM data memory, self-programming, an ICD, 5 channels of 10-bit Analog-to-Digital (A/D) converter, 2 additional timers, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI) or the 2-wire Inter-Integrated Circuit (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART).

**GSM Modem**
RS232 is used to interface the GSM Modem with the Pic Microcontroller. GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit-switched network optimized for full duplex voice telephony.

**Keypad 4X4**
It is used to enter the Password.

**Buzzer**

**Software Requirements**

**Embedded ‘C’ using CCS Compiler**
CCS provides a complete integrated tool suite for developing and debugging embedded applications running on Microchip PIC MCUs and dsPIC DSCs. The heart of this development tools
suite is the CCS intelligent code optimizing Microchip PIC C compiler which frees developers to concentrate on design functionality instead of having to become an MCU architecture expert.

**PIC Downloader**
Using PIC Downloader to implement the Embedded C coding system into Microcontroller by PC Serial Communication port.

**Simulation Software**
Proteus is simulation software which is used to simulate our project.

**IMPLEMENTATION**
- Microcontroller Program Implementation
- Microcontroller and Sensor Implement
- Microcontroller with Relay Implement
- Microcontroller with Keypad Implement
- Microcontroller with GSM Modem Implement

**Microcontroller Program Implementation**
Microcontroller programming to be designed Using of Embedded C and Coding to be Successfully compiled and executed. The Executed hex file was uploaded into microcontroller by using PIC Downloader.

**Microcontroller Pin Connection Diagram**
Microcontroller Pin diagram is clearly shown in diagram.

**Memory Unit**
Memory is part of the microcontrollers whose function is to store data. The easiest way to explain is to describe it as one big closet with lots of drawers. If we suppose that we marked the drawers in such a way that they cannot be confused, any of their contents will then be easily
accessible. It is enough to know the designation of the drawer and so its contents will be known to us for sure.

A. Memory Unit of Microcontroller

Memory components are exactly like that for a certain input we get the contents of a certain addressed memory location and that’s all. Two new concepts are brought to addressing and memory location. Memory consists of all memory locations and addressing is nothing but selecting one of them.

B. Central Processing Unit

Let add three memory locations to a specific block that will have a built in capability to multiply, divide, subtract and move its contents from one memory location onto another. The part we just in are called “Central Processing Unit” (CPU). Its memory locations are called registers. Registers are therefore memory locations whose role is to help with performing various mathematical operations or any other operations with data wherever data can be found. Look at the current situation.

C. Input-Output Unit

Those locations we’ve just added are called “ports”. There are several types of ports: Input, output or bidirectional ports. When working with ports, first of all it is necessary to choose which port we need to work with, and then to send data to, or take it from the port. When working with it the port acts like a memory location. Something is simply being written into or read from it and it could be noticed on the pins of the microcontroller.

D. Serial Communication

Beside stated above we’ve added to the already existing unit the possibility of communication with an outside world. However, this way of communicating has drawbacks. One of the basic drawbacks is the number of lines which need to be used in order to transfer data. The number of lines time’s numbers of kilometers doesn’t promise the economy of the project. It leaves us having to reduce the number of lines in such a way that we don’t lessen its functionality. Suppose we are working with three lines only, and that one line is used for sending data other for receiving, and the third one is used as a reference line for both the input and output side.

MEMS SENSOR

Micro electro mechanical systems or MEMS are integrated micro devices or systems combining electrical and mechanical components. They are fabricated using Integrated Circuit (IC) batch processing techniques and can range in size from micrometers to millimeters. These systems can sense control and actuate on the micro scale and function individually or in arrays to generate effects on the micro scale. “The field of MEMS is based on the use of IC fabrication techniques to create devices capable of acting as mechanical, electrical, and chemical transducers for applications in areas such as automotive and medical industries.” It can be difficult for one to imagine the size of MEMS device. The general size of MEMS is on the order of microns (10 powers -6 m). The main characteristic of MEMS is their small size. Due to their size, MEMS cannot be seen with the unaided eye. An optical microscope is usually required for one to be able to see them.

Microcontroller with Relay Implement

It is used to Microcontroller output to be evaluated through Relay. Relay is used to locked Magnetic door to be released for Microcontroller activities that is using sensor the motion to be captured for correctly means the micro controller to be
instructed to relay the door to be released otherwise the door locked state.

**Microcontroller with Keypad Implement**

It is used to enter the password which is send by the microcontroller through the GSM Modem.

A keypad is a set of buttons arranged in a block or “pad” which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers, then it can also be called a numeric keypad. Here we are using 4 X 4 matrix keypad.

**Interfacing Keypad**

Figure 3 shows how to interface the 4 X 4 matrix keypad to Port C in microcontroller. The rows are connected to an output port and the columns are connected to an input port. To detect a pressed key, the microcontroller grounds all rows by providing 0 to the output latch, and then it reads the columns. If the data read from the columns is C6-C4&D6=1111, no key has been pressed and the process continues until a key press is detected. However, if one of the column bits has a zero, this means that a key press has occurred. For example, if C3-C0=1101, this means that a key in the D1 column has been pressed. After a key press is detected, the microcontroller will go through the process of identifying the key.

**Microcontroller with GSM Modem Implement**

RS232 is used to interface the GSM Modem with the Pic Microcontroller. The Global System for Mobile (GSM) communication is the Second Generation of mobile technology. Although the world is moving towards Third and Fourth generation but GSM has been the most successful and widespread technology in the communication sector. GSM technology paved a new way for mobile communication. This project explains to interfacing a GSM module with a PIC microcontroller to send the random which is generated by the microcontroller.

Figure 4 shows how to interface GSM modem with the PIC16f877A Microcontroller.

**Magnetic Buzzer**

Magnetic buzzer is used to creating sound for
wrong motion passwords. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

**Figure 5: Magnetic Buzzer**

![Magnetic Buzzer Image]

**Features**

i. Small size and Lightweight  

ii. Wave soldering and washing  

iii. High reliable and long life  

iv. Low voltage and low drain  

**Applications**

i. Electronic instrument, medical instrument  

ii. Computer and peripheral units  

iii. Various home appliances, office equipment  

iv. Cash register, Credit card readers.

Simulation Results: Proteus Software
CONCLUSION

Thus by this project, Accelerometer is a sensor which produces the electrical signal as per the movement. The proposed method uses the keypad to enter the password. Initially we have to set the position in accelerometer which is connected with the controller, so the controller gets the input analog signal and produces the respective ADC samples. When the controller realizes that the ADC samples are matched with the predetermined value in a controller, it will wait until we enter the password. If the entered password is matched, it will send the random password to the user mobile through the GSM technology and then the user enter the random password through the keypad interface. If the entered random password is matched, it will send the command signal to the driving circuit. Driving circuit receives the command and forwards the signal to unlock the door.

FUTURE ENHANCEMENT

Text Based Password Management is too simple, easy to break. Voice Based recognition is not accurate and Biometric Based Password Recognition is too expensive. This Motion controlled Password system to be implemented to Bank Security and door oriented Securities. Compare to other security system it two securities these are text based and then motion based security. The correct username and motions of password to be given means the predetermined password of motion to be recognized and system to be running the door to be released otherwise it to be locked, Main advantage of this system is Complex it is not easy to break, Recognition rate is accurate.

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