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HIGH LEVEL SECURITY SYSTEM FOR OPENING THE DOOR USING MEMS TECHNOLOGY

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ABSTRACT

The aim of this work is "high level security system for opening the door using MEMS technology" to provide privacy protection, such that unauthorized persons cannot open the door under any circumstances. This kind of automated door with top secret code can be implemented at important places where high level security is essential. This project work is designed which creates some enthusiasm while decoding the code through MEMS technology.

MEMS is the device often used as position displacement sensor and the applications of MEMS are plenty. To prove, one proto type system is practically designed to control a sliding door mechanism as a security application. MEMS is the integration of the mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology.

In strong rooms, personal labs, etc. most of the security systems those offers password protection is quite common these days, in some places scratch cards or RFID cards are used to identify the users, but all these techniques are became very old and they can decode very easily. So people are looking for new methods which will prove high security and which cannot be decoded easily. There by this technology can be implemented now a day.

Keywords*: Micro Electro Mechanical Systems, Radio-Frequency Identification, sensors, actuators.*

I. INTRODUCTION

In this work, the MEMS sensor is placed at the door and is to be moved in the directions that are defined in the programming of the micro controller. When the person does so the MEMS sensor will be activated as it reads the tilt produced while lifting the panel, this will give signals to the microcontroller. The controller checks this data and if the moved direction sequence is correct it opens the door, otherwise activates the alarm. And when the door is opened, passing person is sensed by the IR sensors and the controller closes the door automatically.

The output of the MEMS (X, Y, and Z) is fed to A/D converter. The channel selection depends upon the address selection sent by the Micro-controller. This ADC is having three address inputs to select one out of eight channels of the ADC. This ADC 0809 is a successive approximation type A/D converter and the clock rate at which the conversion is fed from the IC 555 timer configured as a stable multi vibrator. This is an 8-channel IC, out of 8 channels only 3 channels are used for 3directions.Microcontroller is programmed to give outputs at port pins which are fed to the DC motor through the relays. The driver output is fed to the DC motor, responsible for driving the mechanism.

II. AIM OF THE PROJECT

The project aims for enhancing the security system for opening a door. The present existing system is not sufficient to stop the thief as they find different tampering techniques. So here the project is designed with the latest advanced technology called MEMS. If we introduce this project it would be easy to stop the thief to get into the room. The MEMS is to be moved in different directions to certain angles which the user himself will know. Moving or rotating the MEMS in wrong sequence energizes the alarm as the acknowledgement.

Significance and Applications

The significance of MEMS has been increasing day by day due to its high end secure operation in various

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applications like military, electronics projects, banking applications, research laboratories etc. Most of the security systems that have been previously developed that use security keys such as password, finger print, RFID cards, voice recognition etc., can be bypassed with ease. There by using MEMS technology high level security can be installed.

III. METHODOLOGY

The high level security system for opening the door using mems technology is aimed to provide privacy protection, such that unauthorized persons cannot open the door under any circumstances. This kind of automated door with top secret code can be implemented at important places where high level security is essential. For this, the following components are used to develop model of high level security system:

1. MEMS (Micro Electro Mechanical Systems)
2. ADC (Analog to digital converter)
3. CLOCK GENERATOR
4. DC MOTOR
5. LM 567 TONE DECODER
6. RELAY
7. MICRO CONTROLLER (AT89S52)
8. SENSORS
9. TRANSFORMER (230V-12AC)

Block diagram and Circuit diagram

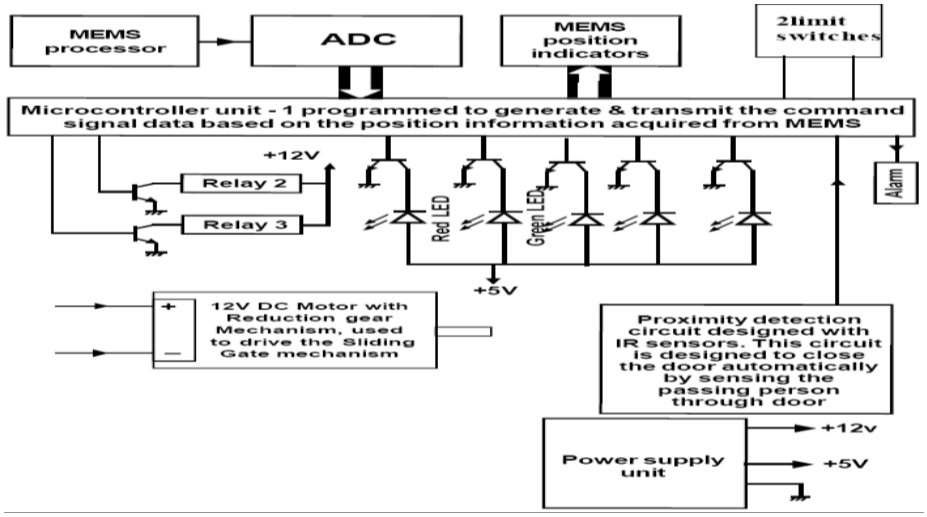

Fig: Block diagram

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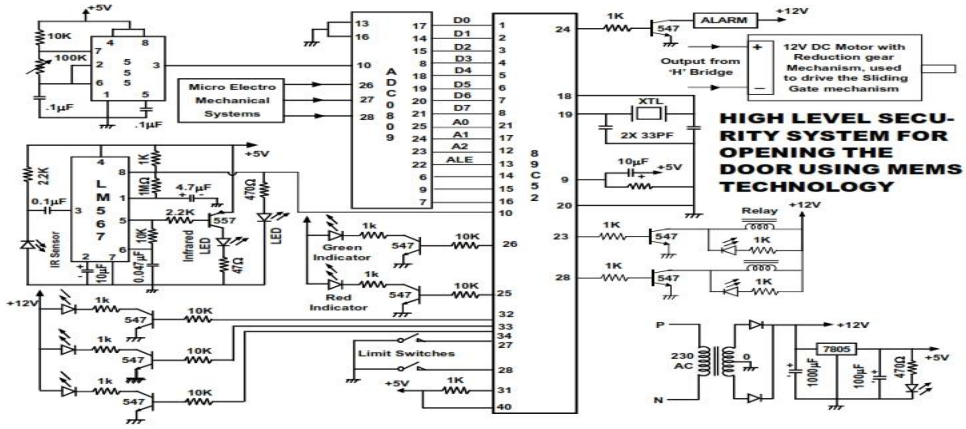

Fig 1: Circuit Diagram

2.2 Working

Security system to control a sliding door mechanism is fabricated with MEMS technology, to open the door a secret code is needed. MEMS component is used as the security key to access the door. The procedure to access the door using MEMS security key is explained below.

The concept is to move or rotate the MEMS device in a sequence through the hand like a key is rotated. When the MEMS is moved at certain angles, voltage variations are produced depending on the angle of rotation or movement. Slight variation in the X, Y, or Z – axes gives us the voltage variation that is fed to the ADC and the digital information is fed to the micro controller. Only authorized persons will know in which direction and to what angle the MEMS is to be moved or rotated. In addition, these angles should be activated in a sequence then only the door will be opened. If the sequence is wrong, door will not be opened & alarm will be raised for a moment.

The MEMS device must move in the directions of the password. This movement of the device will generate the voltage signals. This signals are in the analog form which the microcontroller cannot understand. So they must be converted into digital signals with the help of ADC. ADC will convert these analog signals into digital signals and send those signals to the microcontroller. The voltage signals are already fed into the microcontroller. If these signals are matched with the already fed voltage signals then the motor will activate.

The motor will run with the help of relays. Relays are known as the electric switches. To run the motor in two directions i.e., forward and backward, two relays are used. If the code is matched green led will glow and the door will open with the help of the relay.
Now the person will enter the room. Two IR sensors are present at the entrance of the room. One is transmitter and another is receiver. Transmitter and receiver are kept in opposite to each other. As soon as the person enters the room he will pass between the sensors and break the transmission of IR light. This will make a low in frequency of light. When there is a low frequency the second relay will get activated and the door will close.

While moving the MEMS device if the code is wrong or if any of the position of MEMS device is wrong a red led will glow and buzzer will alarm for few seconds. This makes the hacker impossible to decode the code.

IV. PROGRAM CODE

The following program is used to operate the door in high level security system depending on the values generated by the movement of MEMS component and to compare those generated values as written in the program to open the door. The program is simulated using Keil micro version.

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```
TEMP_ADC DATA 30H
          A0        BIT P2.0
          A1        BIT P3.7
          A2        BIT P3.2
          ALE       BIT P3.3
          SOC       BIT P3.4
          OE        BIT P3.5
          EOC       BIT P3.6
          RLY1      BIT P2.1
          RLY2      BIT P2.2
          BUZZ      BIT P2.3
          RED       BIT P2.4
          GRN       BIT P2.5
           LS1        BIT P2.6
          LS2       BIT P2.7
          SENSOR    BIT P3.0

        ORG    0000H
        ljmp   RESET

   RESET:    CLR     GRN
             CLR     RED
              CLR     BUZZ
             MOV     TEMP_ADC, #00H
             SETB    RLY1   ; gate close
             CLR     RLY2
             JB      LS1,$
             CLR     RLY1
               CLR          RLY2
    MAIN:      setb         A0
             setb           A1
              CLR           A2
             LCALL          GET_ADC
                MOV         A, TEMP_ADC
             CJNE           A, #102D, XX
               XX: JC       OKY1
            CJNE            A, #153D, XXA
            XXA: JC         MAIN
              LCALL         ERR
               LJMP         MAIN
     OKY1: LCALL            DDELAY
            LCALL           DDELAY
OK1:        setb            A0
            setb            A1
               CLR          A2
             LCALL          GET_ADC
                MOV         A, TEMP_ADC
            CJNE            A, #153D, XX1
          XX1: JNC          OKY2
            CJNE            A, #102D, XXB
        XXB: JNC            OK1
              LCALL         ERR

OK3:        CLR     A0
            CLR     A1
              SETB    A2
            LCALL    GET_ADC
              MOV     A, TEMP_ADC
            CJNE     A, #153D, XX3
       XX3: JNC      OK4
            CJNE     A, #102D, XXD
       XXD: JNC      OK3
             LCALL    ERR
            LJMP     MAIN
ERR:        LCALL    DDELAY
            LCALL    DDELAY
            CLR      GRN
            SETB     RED
            SETB          BUZZ
             LCALL        DDELAY
             LCALL        DDELAY
            CLR           GRN
            CLR           RED
             CLR          BUZZ
             RET
     OK4:      SETB       GRN
            CLR           RED
              CLR         BUZZ
            SETB          RLY2;          door
open          CLR         RLY1
            JB            LS2, $
              CLR         RLY1
              CLR         RLY2
              JNB         SENSOR, $
            SETB          RLY1
              CLR         RLY2
              JB          LS1, $
               CLR        RLY1
               CLR         RLY2
                 LJMP   MAIN

          GET_ADC:
            SETB     ALE
            NOP
            NOP
            SETB     SOC
            LCALL    D1
            CLR      ALE
            NOP
            NOP
            CLR      SOC
       EOZ:  JB      P3.6, EOZ
       EOCZ:  JNB    P3.6, EOCZ
            SETB     OE
            MOV      A, P1
```

```
        LJMP    MAIN
OKY2:   LCALL   DDELAY
        LCALL   DDELAY
OK2:    CLR     A0
        CLR     A1
        SETB    A2
        LCALL   GET_ADC
        MOV     A, TEMP_ADC
        CJNE    A, #102D, XX2
XX2:    JC      OKY3
        CJNE    A, #153D, XXC
XXC:    JC      OK2
        LCALL   ERR
        LJMP    MAIN
OKY3:   LCALL   DDELAY
        LCALL   DDELAY
        MOV     TEMP_ADC, A
        NOP
        NOP
        CLR     OE
        RET
D1:
        MOV     R3, #01H
        DJNZ    R3, $
        RET

ddelay: MOV     R4,#90
Zz2:    MOV     R5, #90
Zz1:    MOV     R6, #90
        DJNZ    R6, $
        DJNZ    R5, Zz1
        DJNZ    R4, Zz2
        RET
        END
```

The above program is executed and is successful in coding the high level security key to open the door. The following figures shows the prototype models of the work.

Fig 2: Prototype Module of high level security system using MEMS

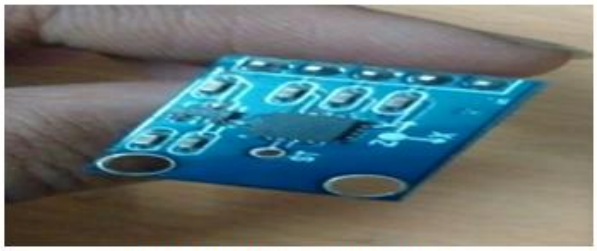

Fig 3. MEMS Accelerometer

Fig 4: Circuit Board

Fig 5: IR Sensor

V. RESULT & DISCUSSION

The design and fabrication of "High level security system for opening the door using MEMS technology" is developed successfully. The High level security system for Opening door project is successfully able to provide high level security. This can be implemented in various applications like military applications and banking applications in locker rooms, personal labs, etc.

Most of the security systems those offers password protection is quite common these days, in some places scratch cards or RFID cards are used to identify the users, but all these techniques are became very old and they can decode very easily. So people are looking for new methods which will prove high security and which cannot be decoded easily. There by this technology can be implemented now a days for security systems.

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VI. CONCLUSION

The project work High level security for opening the door using MEMS technology is designed and developed successfully. For the demonstration purpose, a prototype module is constructed and the results are found to be satisfactory. Since it is a prototype module, a simple module is constructed, which can be used for many applications like highly confidential area or where high level security is required. In this project we have explained why security is important in an Ambient Intelligent environment.

In order to achieve Trust and Security not only cryptographic algorithms are needed but also secure methods for generation and storage of secret keys. The Physical invisible devices can be used to this end because they have built in security properties such as uncloneability and tamper proof evidence. By construction of such invisible security devices the keys can be made tamper proof and avoid them from destruction by the anti-social elements or the unofficial persons.

VII. ACKNOWLEDGEMENTS

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