NEW HORIZON
COLLEGE OF ENGINEERING
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade.

# "PASSWORD BASED DOOR LOCK SYSTEM USING 8051 MICROCONTROLLER"

**A MINIPROJECT REPORT**

*Submitted by*


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***In partial fulfillment for the award of the degree of***

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION

NEW HORIZON COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

# CERTIFICATE

Certified that the mini project work entitled **"Password Based Door Lock System Using 8051 Microcontroller"** carried out by **R Anusha (1NH18EC089), Uma Devi (1NH18EC114), Yoshitha S (1NH18EC126), Basavaraj N Hirebidari (1NH19EC401),** Bonafide student of Electronics and Communication Department, New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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1.

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# ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr. Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, head of the department of Electronics and Communication Engineering. We extend sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance to us by our beloved guide **Mr. Rajiv Gopal** to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

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# ABSTRACT

## Password Based Door Lock System Using 8051 Microcontroller


- In our day to day lives, security is one of the prime concerns. We want to ensure safety to the fullest.
- Door control access is an important linkage in the security chain. A password-based door lock microcontroller is a system that permits access to only authorized users into secured/restricted areas.
- This system is entirely managed by the 8-bit microcontroller AT89C2051, it has 2K bytes of ROM. The user given password is usually stored in the EPROM so it can be changed as per our convenience. The system includes a keypad that intakes the password. On entering the password, if matched with the one stored in the memory then the relay turns on and opens the door. The user would have to enter the pre-set password before entering and leaving the area to be extra careful and avoid intrusion.
- This is a digital lock system and these systems can easily be operated through our smart phones as well which conveniently avoids the need to carry keys around everywhere and risk to lose it.
- Making use of proper intelligence and incorporating it with modern technology can avoid many problems although have some disadvantages.



**Keywords**: Security, password, microcontroller

# CHAPTER 01

# INTRODUCTION

- Conventional door lock systems that use a mechanical lock and key appliance have been replaced by these newer advanced techniques of door lock systems.
- Automatic systems are more in demand in current day industries and companies to ensure safety of their valuables.
- These new techniques are highly intelligent as they use a combination of electrical and mechanical controls. Such automatic door lock systems include an electronic command connection which controls the load at the output via password.
- The simplicity and high efficiency of this system is one of its most prominent features. The load at the output could be a lamp, a motor etc or any other mechanic/electric appliance.
- In this project, we're developing an electronic lock system that uses an 8051 microcontroller, which enables control to operate the load. This is a simple embedded system that takes input from a keypad and activates the load (output) correspondingly.
- This lock system exhibits a password-based door lock system where in when a correctly entered code/password is entered, the door permits access and allows the person to enter the restricted/secured area.
- Upon entering the wrong password, the door remains closed thereby denying access to unauthorized users and protects the system.
- They are widely used at workplaces, banks, offices, home etc to ensure safety. Banks can make use of these lock systems to provide maximum security to the money stored in vaults. They are also used at airports, hotels, hospitals, prison, any other government authorized areas etc as well.

# CHAPTER 02

# LITERATURE SURVEY

1) High voltage circuit breaker written by R.D.Grazon (2002)
   Better understanding of design and applications

2) A comprehensive scheme for reliability centered maintenance in power distribution systems written by P.Dehghanian (2012)
   Information about safety measures

3) M.Kezunovic (2005)
   Analysis of circuit breaker operation

4) Automated circuit breaker monitoring written by M.Kezunovic (2002) which is informative.

# CHAPTER 03

## EXISITING SYSTEM AND PROBLEM STATEMENT

### Existing System:

- A microcontroller is a compressed integrated circuit that is designed to perform a specified function in an embedded system.
- A microcontroller consists of a processor, memory and an input/output exterior on a single chip.
- Its various types are:
  1. 8051- microcontroller
  2. ARM microcontroller
  3. AVR microcontroller
  4. MSP microcontroller
  5. PIC microcontroller

- The 8051- microcontroller was designed by intel in 1981, In this project we're using a AT89C52 Microcontroller
- AT89C52 Microcontroller is an 8-bit microcontroller that requires a +5V DC

### Problem Statement:

To construct a password-based door lock system using an 8051 microcontroller.

### Objective:

- The primary objective of the project is to provide safety at regular places like home, office, a public place etc. The user would just have to give a known password.
- To ensure the security level in order to prevent unauthorized access.

# CHAPTER 04

# PROPOSED METHODOLOGY

- An electronic lock enables the activation of a high-voltage electronic device when entering a secure password.
- The system we use here uses a microcontroller as the processing unit for the electronic lock.
- Micro Controller Unit (MCU) interface with 4 * 4 matrix keypad and 16 * 2 LCD in user interface.
- This model can be used to protect any electrical electronic device using a password.
- The output of the circuit is interconnected with a dual active door lock and it enables the electronic door lock system.
- The system will turn on / off when entering a unique password generated by the user on the device.

The electronic lock enables the activation of an electric appliance on entering the correct secured password. The system used here requires a microcontroller, which acts as the processing unit for the electronic lock. The microcontroller unit i.e., MCU is interlinked to a 16*2 LCD to the user interface and a 4*4 matrix keypad. This model is widely used to secure electronic locks via password. The output of this circuit is interfaced with an electrically activated door lock. This set up enables the system by opening the door on entering the unique password set by the user.

# CHAPTER 05

# PROJECT DESCRIPTION

A password-based door lock system using the 8051 microcontroller is a simple project in which a powerful password will act as a door unlock system.

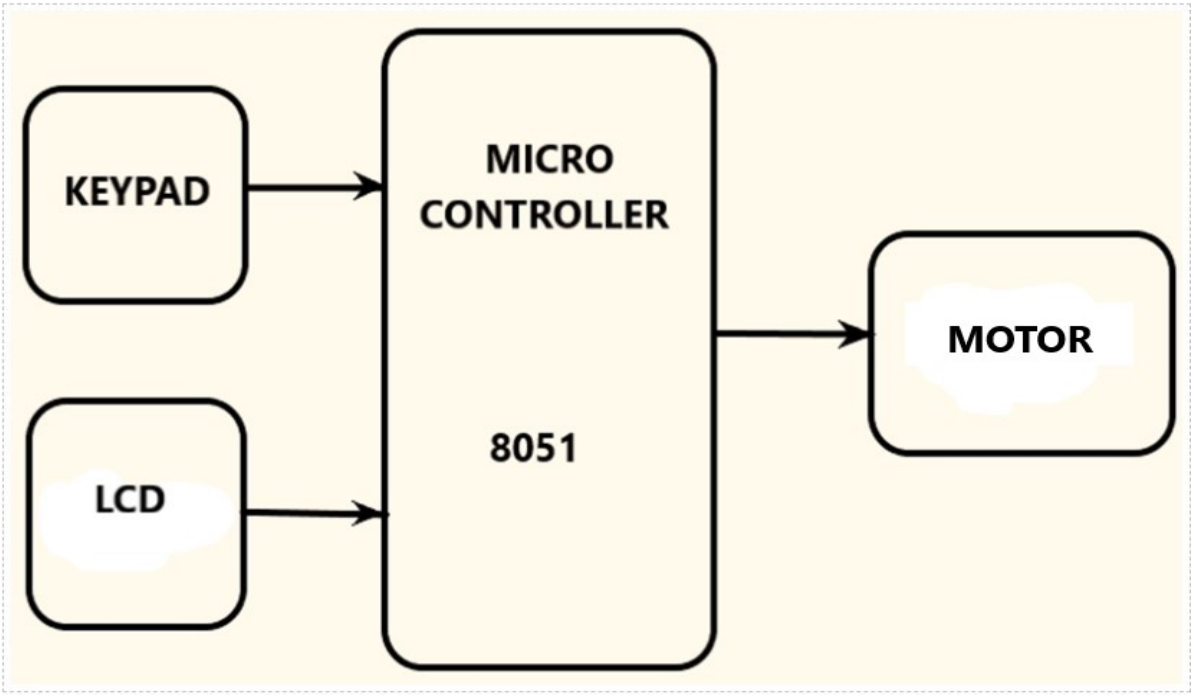
Traditional lock systems using mechanical locks and key mechanisms are being replaced by new improved lock systems. These advanced techniques are a combination of mechanical and electronic devices and are very intelligent. One of the outstanding features of this innovative lock system is its simplicity and high efficiency.

That said, the automated locking system consists of an electronic control assembly, which controls the output of the passwords. This output can be a motor or lamp or any other mechanical / electrical load.

Here, we develop an electronic code lock system using the 8051-microcontroller (a password-based door lock system using 8051 microcontroller), which controls the activation of the load. With input from the keyboard, it is a simple embedded system and accordingly the output triggers.

The system displays a password-based door lock system using the 8051-microcontroller, which allows the door to be opened after entering the correct code or password and the person being asked to enter the safe area. Again, if someone else comes, they need to enter the password, If the password is incorrect, the door will be closed to prevent the person from entering.

# Block Diagram




A microcontroller-based door lock is an access control system that allows only one authorized person to enter a restricted area. The system is fully controlled by the 8051 8-bit microcontroller, which has 2 KB of ROM for program memory. The password is stored in EPROM so that we can change it at any time. The system has a keyboard that can be used to enter passwords When the password entered is the same as the password stored in the memory, the door will open. If we enter a wrong password, Then the door will remain closed.

**Microcontroller:** This is the CPU of our project (Central Processing Unit) We will use a micro controller of 8051 families the various functions of the microcontroller are:

- Reading digital input from the keyboard.
- Send this information to the LCD so that the person running this project should read the password.
- Sensing the password using the keypad and checking if it is a correct or wrong password and rotating the stepper motor if the entered password is the correct password.

**LCD:** We're going to use a 16*2 alphanumeric liquid crystal display (LCD), which means you can display alphabets with numbers in two rows, each with 16 letters.

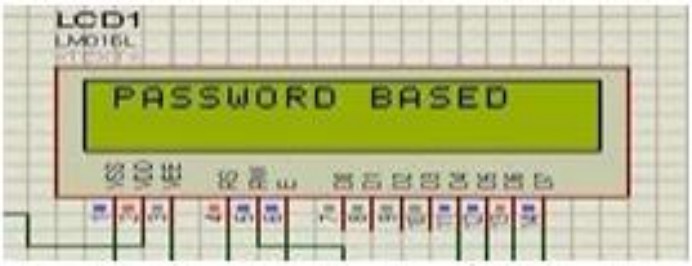
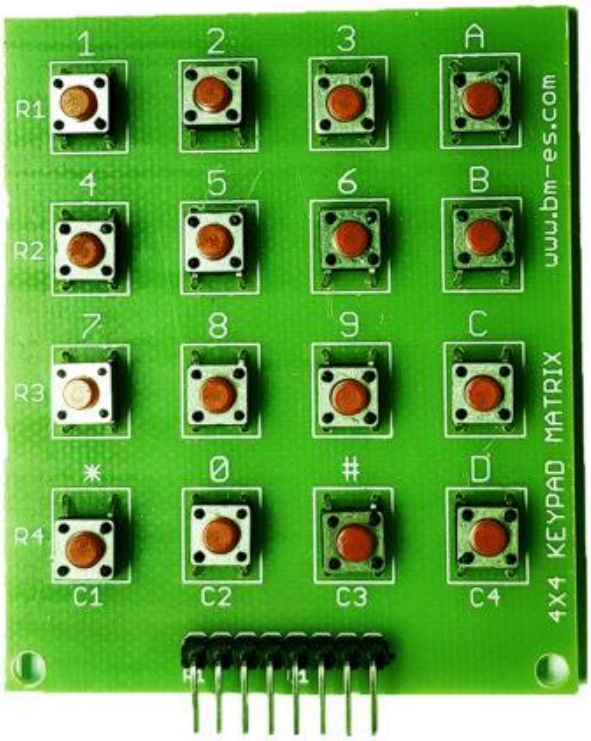



Figure: LCD

**KEYPAD:** The user will enter the password using the keypad, in our project we are using a 4 * 4 matrix to provide input.



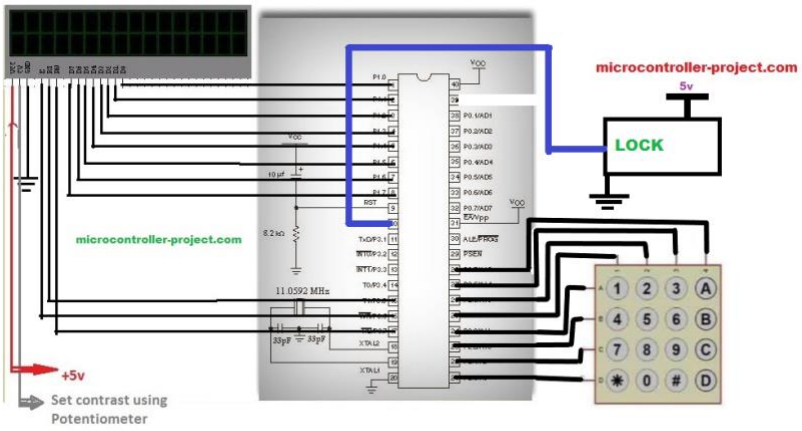
**MOTOR:** The actuator is a device that really speeds up or acts like a motor. There are different types of motors available in the real world that work at different voltages Therefore, we need a motor driver to drive them through the controller, to get an interface between the motor and the microcontroller.

## Principle:

The main component of the circuit is the 8051- controller. In this project 4 × 4 matrix keyboards are used to enter the password. The entered password is compared to the default password

If the entered password is correct, the system turns the door motor and opens the door to display the door status on the LCD screen. If the password is incorrect, the door is locked and the "WRONG PIN" appears on the LCD.

## Circuit Diagram of Password Based Door Lock System



# Components Required

## Hardware Components:

- 8051 Microcontroller
- 8051 Development Board
- 4×4 Matrix Keypad
- 16×2 LCD
- Motor
- Connecting wires
- Power Supply

## Software Components:

- Keil µVision IDE

## 8051 Development Board:

Any desired prototype can be designed using this board by the user. A 40 pin 8051-microcontroller can be used for interfacing and developing our own design. This board consists of an RS232 driver which makes it easier to connect it to a PC or any other embedded hardware. Both AC and DC power supply adaptors can be used due to the presence of a bridge rectifier on the board.

**Features:**

- Easy to be tested with Berg connecting wires
- 7 segment multiplexed display (4)
- A serial port for ISP
- Regulated Power Supply (5V,12V) to
- Interface ready for 16*2 LCD display
- DC Power Supply Connector(12V)
- An RS232 Serial Port
- 8 LED array
- Matrix Keypad
- 4 Interrupt Switches
- Analog inputs (potentiometer)
- Serial EEPROM (12C Devices)
- 40 pin ZIF Socket

## 8051 Microcontroller:

An 8051-microcontroller is an 8-bit microcontroller created by Intel Corporation in 1981. It consists of an 8-bit processor which enables it to operate on 8-bit data at a time. It is a popular and widely used microcontroller.

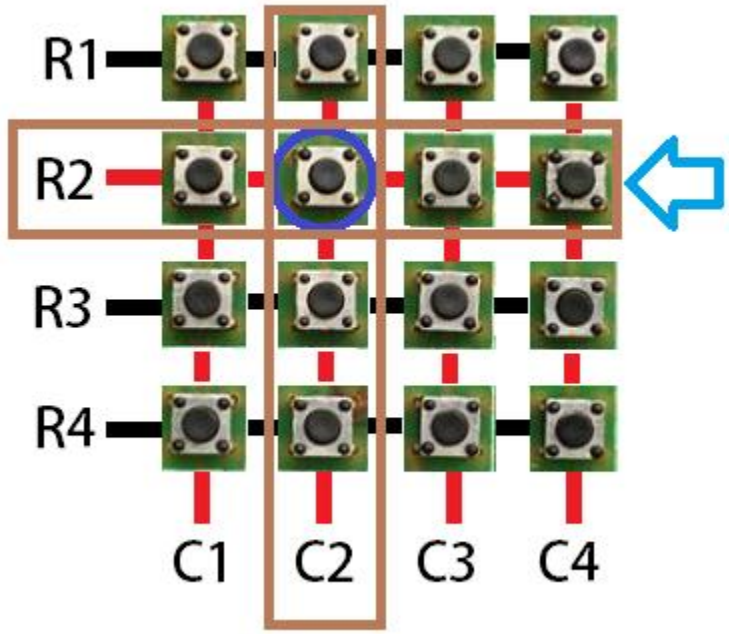
It has an 8-bit data bus and a 16-bit address bus as it is an 8-bit microcontroller. It also holds 4KB ROM with 128 bytes RAM.

**Characteristics of 8051-microcontroller:**

- 8-bit processor
- 8-bit data bus
- 32 input/output lines
- Program Memory of 4KB (ROM)
- Data Memory of 128 bytes (RAM)
- 2 timers of 16 bit each
- Offers bit addressable format
- Special function serial and registers port

Microcontrollers are used in various appliances such as automobiles, electronic gadgets such as keyboard, mouse and so on, household items such as washing machines, microwave ovens and others, e-commerce.

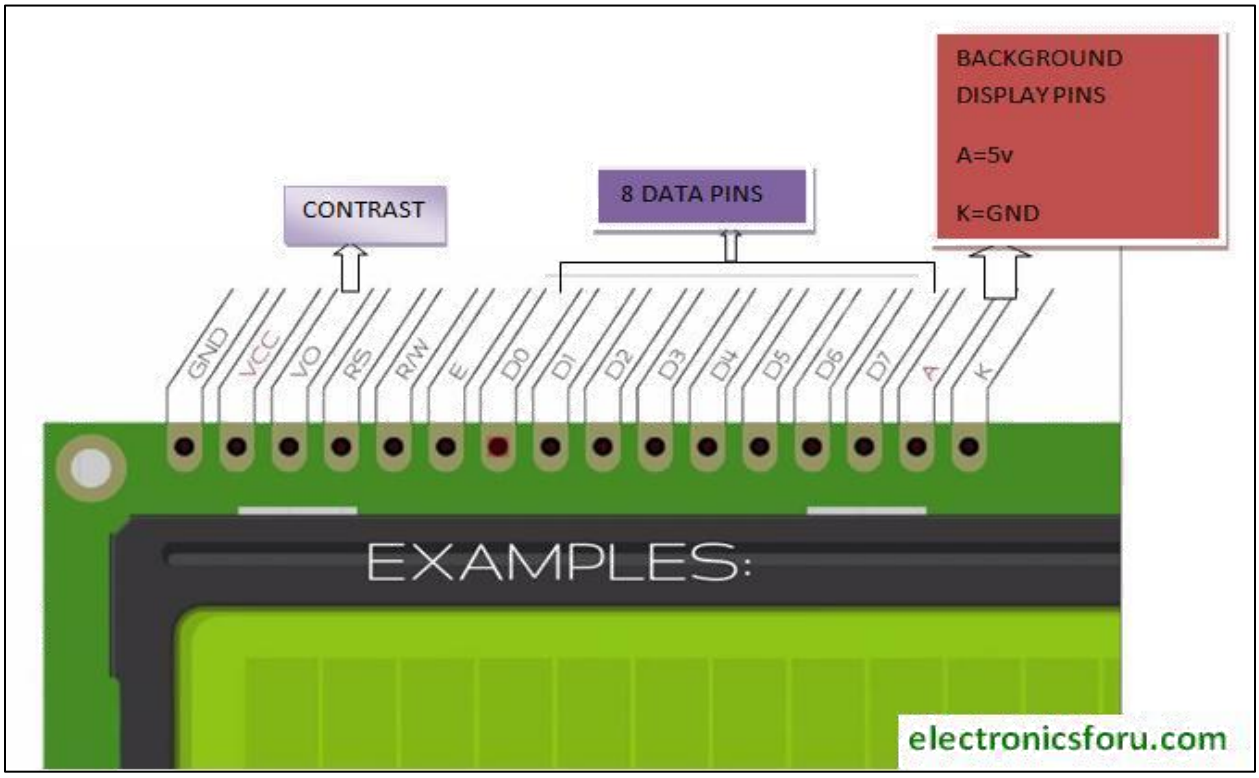
## 4*4 Matrix Keypad:




| Pin Number | Description |
|---|---|
| **ROWS** | |
| 1 | PIN1 is taken out from 1st ROW |
| 2 | PIN2 is taken out from 2nd ROW |
| 3 | PIN3 is taken out from 3rd ROW |
| 4 | PIN4 is taken out from 4th ROW |
| **COLUMN** | |
| 5 | PIN5 is taken out from 1st COLUMN |
| 6 | PIN6 is taken out from 2nd COLUMN |
| 7 | PIN7 is taken out from 3rd COLUMN |
| 8 | PIN8 is taken out from 4th COLUMN |

There will be eight terminals on a 4X4 keyboard as given in the table above. Four of them are ROWS of MATRIX and four of them are COLUMNS of MATRIX. These 8 PINS MODULE have been removed from the 16 buttons present. Those 16 alphanumeric numbers on the MODULE page are the 16 buttons used in the MATRIX structure.

## 16*2 LCD:

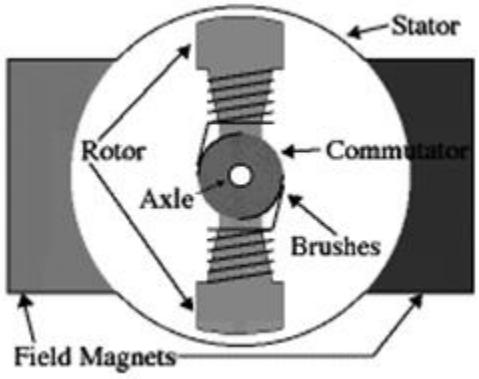


| PNO.<br><br>1. | **Function:**<br><br>Ground (0V) | **Name:**<br><br>Ground |
|---|---|---|
| 2 | Supply voltage; 5V (4.7V – 5.3V) | V cc |
| 3 | Contrast in the adjustment; the best way is to use a potentiometer. The output of the potentiometer is connected to this pin. Rotate the potentiometer knob forward and backwards to adjust the LCD contrast. | Vo / VEE |
| 4 | Selects command register when low, and data register when high | RS (Register/Select) |
| 5 | Low to write to the register, High to read from the register | Read/write |
| 6 | Sends data to data pins when a high to low pulse is given; Extra voltage push is required to execute the instruction and EN (enable) signal is used for this purpose. Usually, we make EN=0 (low) and when we want to execute the instruction, we make EN=1 (high) for some milliseconds. After this we again make it ground that is, EN=0. | Enable |
| 7 | 8-bit data pins<br>In the lcd pin outs | DB0 |
| 8 | | DB1 |
| 9 | | DB2 |
| 10 | | DB3 |
| 11 | | DB4 |
| 12 | | DB5 |
| 13 | | DB6 |
| 14 | | DB7 |
| 15 | Background light VCC (5V) | Led+ |
| 16 | Background light Ground (0V) | Led- |

Liquid crystal display is used to show the entered password. The available display is a 16*2 LCD display. The part 16*2 means that the LCD has two lines which displays 16 characters each line. Therefore, it can display 32 characters at once. These displays can be wired in either four-bit or eight-bit mode.

## Motor:

A DC motor is an electric motor that runs on direct current in an electric motor, the operation depends on simple electromagnetism. A conductor carrying a current creates a magnetic field, when it is placed in an external magnetic field, it will face a force proportional to the force of the current and the external magnetic field in the conductor. It is a device that converts electrical energy into mechanical energy It works that a current-carrying conductor placed in the magnetic field senses a force that rotates to its original position. Practical DC motor field winding to provide magnetic flux and armature which acts as conductor.




# Software

## Code:

```
#include<reg52.h>

sbit r0=P2^0;  sbit r1=P2^1;  sbit r2=P2^2;  sbit r3=P2^3;  sbit c0=P2^4;  sbit c1=P2^5;

sbit c2=P2^6;  sbit c3=P2^7 ; sbit en=P3^6;  sbit rs=P3^5;  sbit rw=P3^7;  sbit lock=P3^0;

char t1[]="Enter PIN:";

char t2[]="Access Granted";

char t3[]="Access Denied";

char pin[]="1234";
```

```
char pinEntered[4];
unsigned int m = 0;
unsigned int flag = 0;

void delay(unsigned int no)
{
unsigned int i,j;
for(j=0;j<=no;j++)    for(i=0;i<=10;i++);
}

void lcdcmd(unsigned int  command){
P1=command;   rw=0;   rs=0;   en=0;   delay(1000);   en=1;   delay(1000);   en=0;
}

void lcddata(char data1)
{
P1=data1;   rw=0;   rs=1;   en=0;   delay(1000);   en=1;   delay(1000);   en=0;
}
void lcdint(){
lcdcmd(0x30);   delay(1000);   lcdcmd(0x30);   delay(1000);   lcdcmd(0x30);   delay(1000);
lcdcmd(0x30);   delay(1000);   lcdcmd(0x30);   delay(1000);   lcdcmd(0x38);   delay(1000);
lcdcmd(0x01);   delay(1000);   lcdcmd(0x0F);   delay(1000);   lcdcmd(0x80);   delay(1000);
}
```

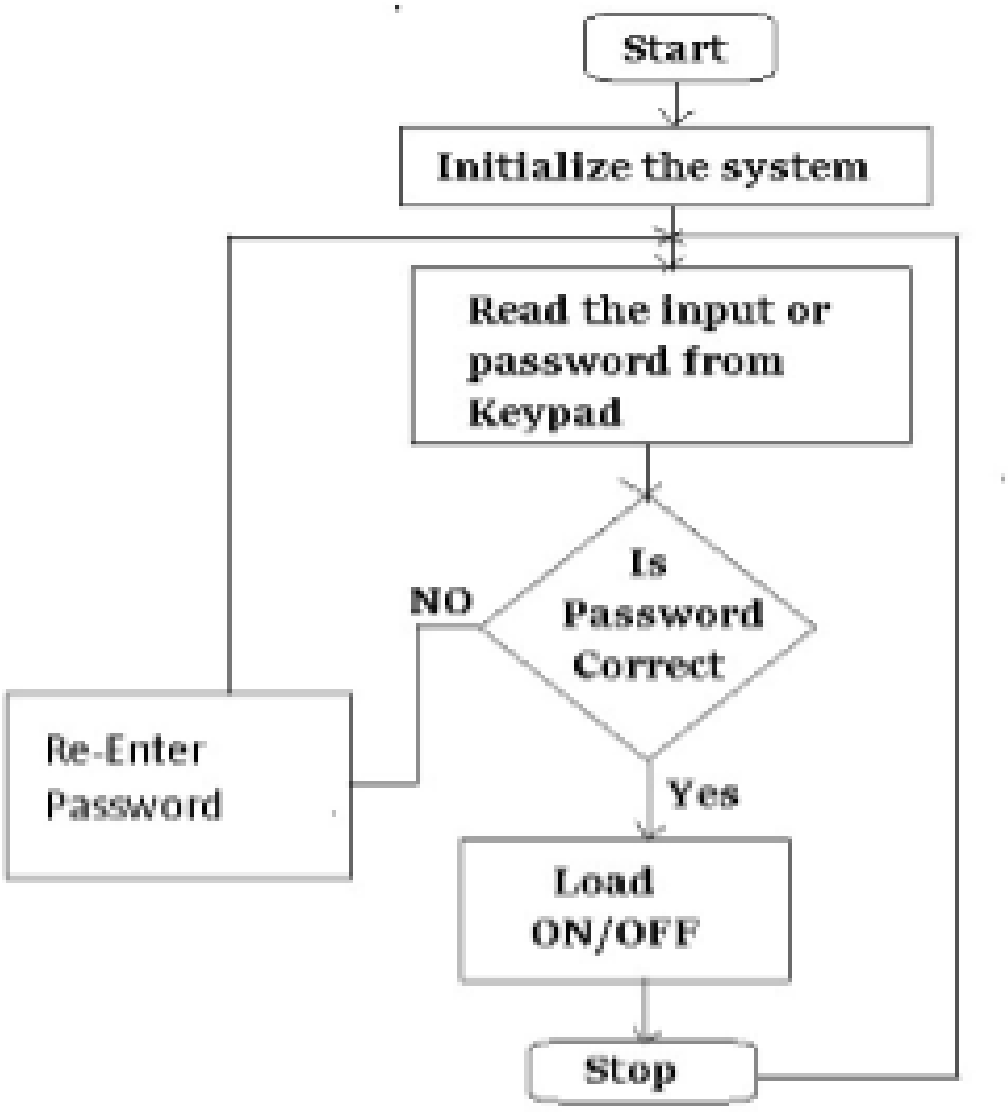
```
char keypad()
{
char c='a';
while(c!='s'){
r0=0;r1=1;r2=1;r3=1;
if(c0==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '0';}
 if(c1==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '1';}
 if(c2==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '2';}
 if(c3==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '3';}

r0=1;r1=0;r2=1;r3=1;
if(c0==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '4';}
 if(c1==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '5';}
 if(c2==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '6';}
 if(c3==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '7';}

r0=1;r1=1;r2=0;r3=1;
if(c0==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '8';}
 if(c1==0){lcddata('*');P0=0xF0;delay(10000);c='s';return '9';}
 if(c2==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'A';}
 if(c3==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'B';}
```

```
r0=1;r1=1;r2=1;r3=0;
if(c0==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'C';}
 if(c1==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'D';}
 if(c2==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'E';}
 if(c3==0){lcddata('*');P0=0xF0;delay(10000);c='s';return 'F';}

}
}

void main()
{
   unsigned int i=0;
   P1=0x00;   P2=0xF0;   P3=0x00;
   lcdint();
   while(1){
   i=0;
   while(t1[i]!='\0')
   {
      lcddata(t1[i]);
      i++;
   }
   lock=0;
```

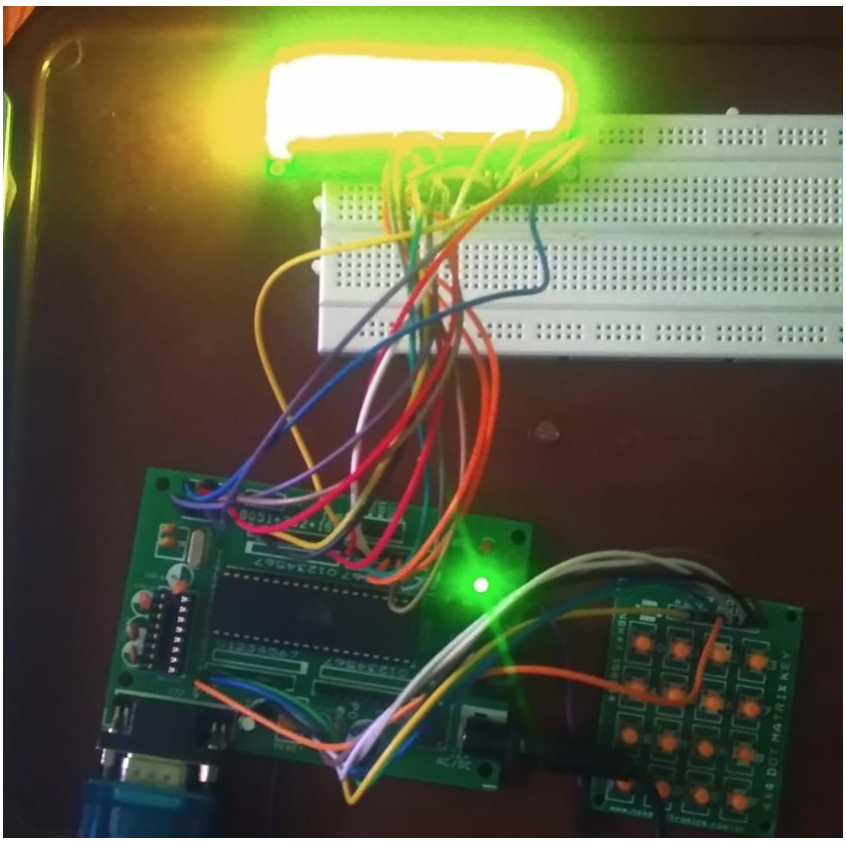
```
lcdcmd(0xC0);


for(i=0;i<=3;i++)
 pinEntered[i] =keypad();
i=0;
lcdcmd(0x01);


if(pinEntered[0]==pin[0])
{      i++;
   if(pinEntered[1]==pin[1])
   {
      if(pinEntered[2]==pin[2])
      {
         if(pinEntered[3]==pin[3])
         {
            lock=1;     i=0;
                  while(t2[i]!='\0')
                    {
                       lcddata(t2[i]);
                       i++;
                    }i=0;
         }
      }
```

```
      }
   }else{    i=0;
       while(t3[i]!='\0')
      {
         lcddata(t3[i]);
         i++;
      } i=0; }


   if(i!=0)
   {
 i=0;
       while(t3[i]!='\0')
      {
         lcddata(t3[i]);
         i++;
      }
   }
   delay (1000000);
   lcdcmd(0x01);
   lcdcmd(0x80);
 i=0;
} }
```

## FLOWCHART OF THE PROGRAM



# Working:



In this project we are designing a simple automatic door lock system using 89s52 microcontroller, an LCD (16*2), 4*4 numeric keypad and a digital lock. Here, the microcontroller is the intelligent unit i.e., it carries out all the processing steps.

A predefined password is downloaded in the code which the user will have to enter in order to access the system. If the entered code matches the predefined one the door will open and let the user in. The messages such as **“Enter Pin”**, **“Access Granted”**, **“Access Denied”** will be shown on the LCD screen accordingly.

**Pin Connections:**

LCD (16*2) is interfaced in 8-bit mode with the 89s52 microcontroller.

Port 1 of 89s52 microcontroller is connected to the data pins of 16*2 LCD.

Port 3 pin 5 is connected to RS (register select) pin of LCD.

Port 3 pin 6 is connected to EN (enable) pin of LCD.

Port 3 pin 7 is connected to RW (read write) pin of LCD.

Lock is attached to port 3 pin 0.

4*4 keypad is attached to port 2 of the 8051-microcontroller.

Keypad connections are as follows-

| | |
|---|---|
| Row 0 - Port 2 pin 0 | Column 0- Port 2 pin 4 |
| Row 1 - Port 2 pin 1 | Column 1- Port 2 pin 5 |
| Row 2 -Port 2 pin 2 | Column 2- Port 2 pin 6 |
| Row 3- Port 2 pin 3 | Column 3- Port 2 pin 7 |

**Door Lock System:**

A small DC motor is attached to the transistor at the source. This motor is operating on 9V. The transistor gate is connected to port 3 pin 0 so when the right password is entered by the user the transistor turns on and the motor rotates to open the lock.

**Door Lock Code:**

The code is simple to understand as it is written in C language. The header file **reg51.h** is included. Keil is used as the software tool to implement this code. The keypad rows and columns are then declared. The controlling pins and lock controlling pin of the LCD are defined. All the above pins are declared individually as they are used in the code individually. The data pins are not defined as the entire port 1 is dedicated for data pins on LCD, data is sent here in a parallel 8-bit form.

Then, character arrays are defined which contain messages that are to be displayed on the LCD screen on whether or not the condition is met i.e., verifying the password in this case. The preset password is **"1234"**. Now this can be changed as per our convenience but ensure that it is not longer than 4 characters.

**Functions used in Code:**

- void main () main function
- void delay () to generate variable delay
- void cmd () to send commands to LCD
- void lcddata () to send data to LCD
- void cdint () to initialize the LCD
- char keypad () scans keypad keys & takes input from user

# CHAPTER 06

## RESULT AND DISCUSSION

• The password-based door lock is successfully built and the purpose is served. When the password is entered, it is displayed on the LCD. The correct password grants access to the door and the wrong one denies access.

• It can be easily accessed and installed

• It works easily with a password generated.

• It is highly secure and unauthorized user cannot access the area.

• It is economical.

Unauthorized access is denied, so safety is ensured. We have learnt how to safeguard a room or any locking system with a password which is like a digital key.

We have learnt how to use 8051 microcontroller and coding using Keil μvision and other instructions to implement the project.

We can further use the information acquired from the project to implement it using face recognition or voice recognition.

- This simple circuit can be used at residential places to ensure better safety.
- It can be used at organizations to ensure authorized access to highly secured places.
- With a slight modification this Project can be used to control the switching of loads through password.
- This project can be used in offices, companies also at home. It will provide keyless entry.
- This can be used in Banks for safety lock.

# CHAPTER 07

## CONCLUSION

- The work was done successfully. It is evidence that the use of keypad with the right circuitry can be used to operate a security system. These systems have the ability to accesses a secure place (house, ATM, industries, office etc.). A password-based recognition system can easily perform variation. In variation the system compares an input password to the enrolled password of a specific user to determine, if they are form the same password. Now the security of our home, office etc.

## FUTURE SCOPE

- We can use Mobile or Internet for to send data to remote locations.
- We can add fingerprint sensors so there will be an entry Permitted for authorized persons using their Fingerprint.
- We can add fire, wind and LPG sensors so that, the doors will automatically open.

# REFERENCES


- D. W. Bliss, P. A. Parker, A. R. Margetts, "Simultaneous transmission and reception for improved wireless network performance", Statistical Signal Processing 2007 IEEE/SP 14th Workshop on pp. 478-482, 2007.
- Electronic circuits and devices: J.B. Gupta.
- Op-amps and linear integrated circuits by Ramakanth A. Gayakwad
- Integrated circuits by K.R. Botkar
- The 8051-microcontroller by Muhammed Ali Mazidi

# APPENDIX

- IEEE papers for password-based door locks
- IRJET papers of electronic door locks