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Password Based Door Lock

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Summary/Abstract

Often times, we need to secure a room at our home or office so that no one can access the room without our permission and ensure protection against theft or loss of our important accessories and assets. There are so many types of security systems present today but behind the scene, for authentication they all relay on fingerprint, retina scanner, iris scanner, face id, tongue scanner, RFID reader, password, pin, patterns, etc. Off all the solutions the low-cost one is to use a password or pin-based system.

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Generation and Mobilization of Idea

Password Based Door Lock System using 8086 Microcontroller is a simple project where a secure password will act as a door unlocking system. Traditional lock systems using mechanical lock and key mechanism are being replaced by new advanced techniques of locking system. These techniques are an integration of mechanical and electronic devices and are highly intelligent. One of the prominent features of these innovative lock systems is their simplicity and high efficiency.

Such an automatic lock system consists of electronic control assembly, which controls the output load through a password. This output load can be a motor or a lamp or any other mechanical/electrical load.

1.1. Background

Our Digital Code Lock project – is a simple electronic number lock system or an electronic combination lock using 8086. The system collects user input as switches, compares the user input with the preset password inside the program, and if the user input and stored password matches, access will be granted (by opening the door with the help of relay for a few seconds and closing it automatically after the stipulated time). If there is a mismatch between user input and stored password, access will be denied (by not opening the closed door – that is by keeping the relay in OFF position)).

1.2. Motivation

To lower the cost of having a password-based door lock and increasing efficiency of the system this project can help much fulfilling requirements.

1.3. Objective

For producing low cost, high efficiency and simple and secure door locks that can be accessed with a keypad (numbers) to implement the idea of transferring manual mechanism to a technological vision this project aims to achieve.

1.4. Contributions

Rather than an Microcontroller a 8086 microprocessor has been used with integration of 8255. We have tried to lower the number of code lines and increase the speed and decrease the cost for components to achieve the target.

1.5. Organization of the Thesis

In next chapter hardware schematic and flow of program has been provided.

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Schematic & Components

2.1. Components

1. 8086

8086 Microprocessor is an enhanced version of 8085Microprocessor that was designed by Intel in 1976. It is a 16-bit Microprocessor having 20 address lines and16 data lines that provides up to 1MB storage. It consists of powerful instruction set, which provides operations like multiplication and division easily.

It supports two modes of operation, i.e. Maximum mode and Minimum mode. Maximum mode is suitable for system having multiple processors and Minimum mode is suitable for system having a single processor.
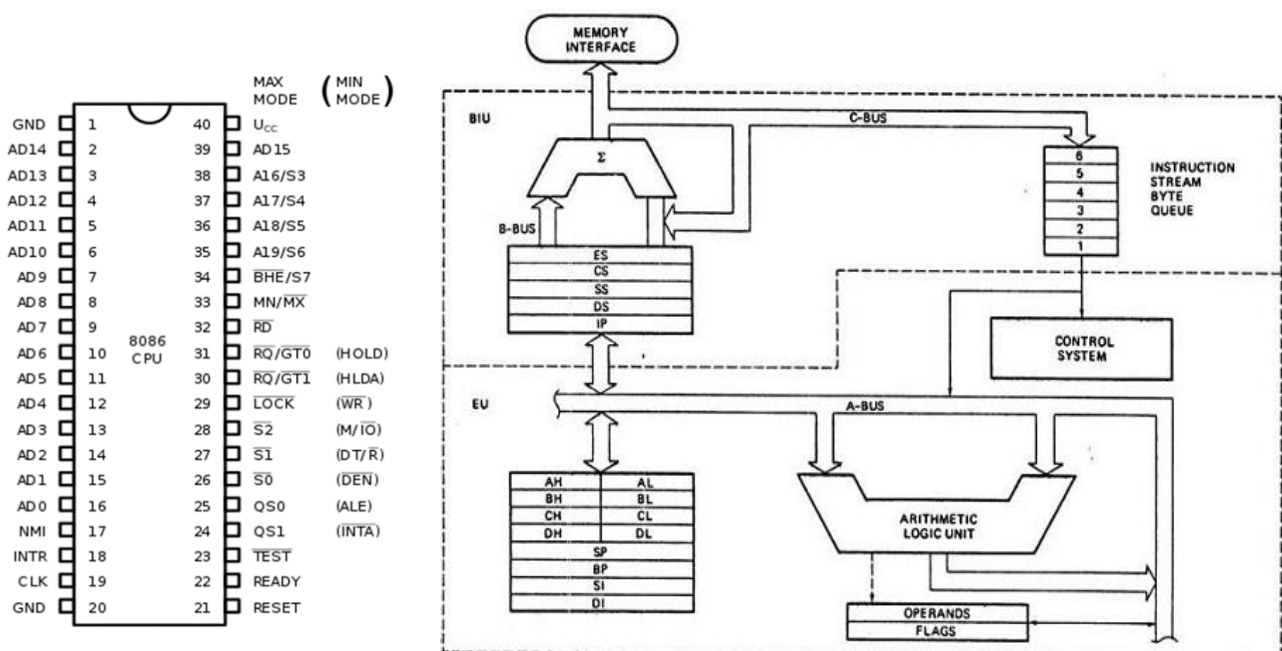

Architecture of 8086

2. 74HC373

The 74HC373; 74HCT373 is an octal D-type transparent latch with 3-state outputs. The device features latch enable (LE) and output enable (OE) inputs. When LE is HIGH, data at the inputs enter the latches. In this condition the latches are transparent, a latch output will change each time its corresponding D-input changes. When LE is LOW the latches store the information that was present at the inputs a set-up time preceding the HIGH-to-LOW transition of LE. A HIGH on OE causes the outputs to assume a high-impedance OFF-state. Operation of the OE input does not affect the state of the latches. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of VCC.


PIN 20=V$_{CC}$
PIN 10 = GND
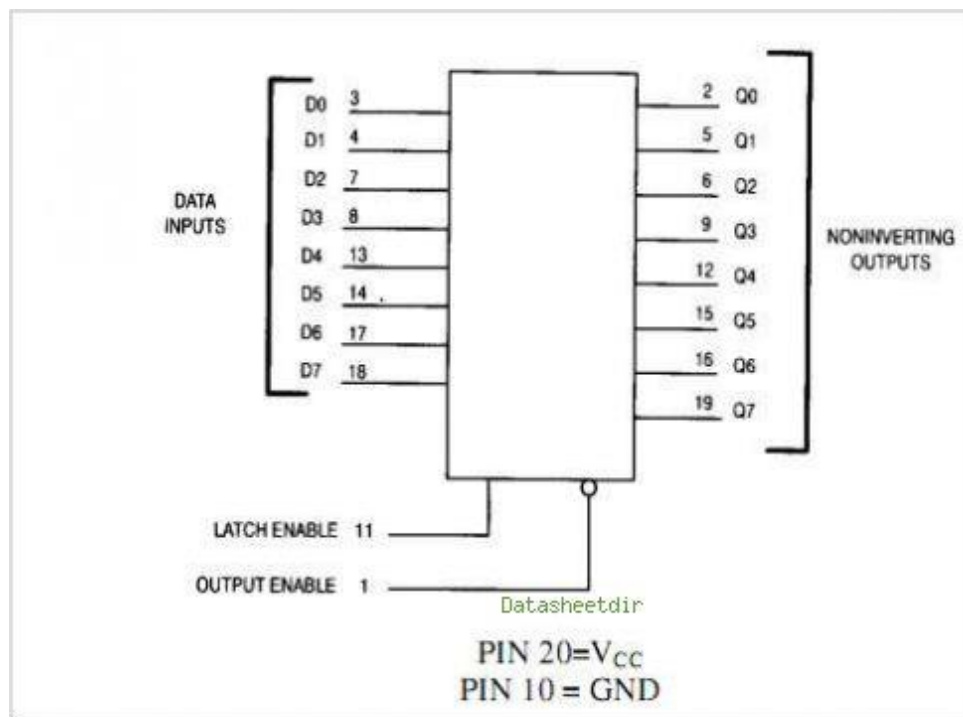
3. 8255

8255 is a popularly used parallel, programmable input-output device. It can be used to transfer data under various condition from simple input-output to interrupt input-output. This is economical, functional, flexible but is a little complex and general purpose i/o device that can be used with almost any microprocessor.
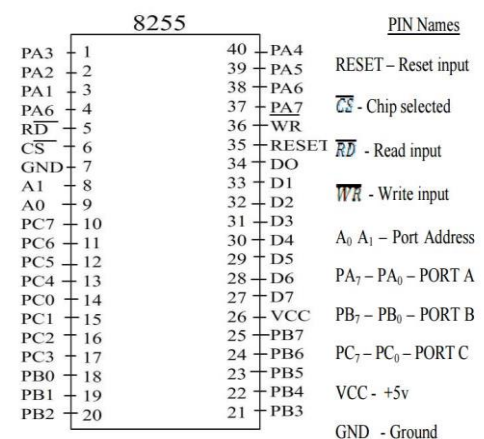
The block diagram is shown below:

2.2. Schematic and Circuit Diagram

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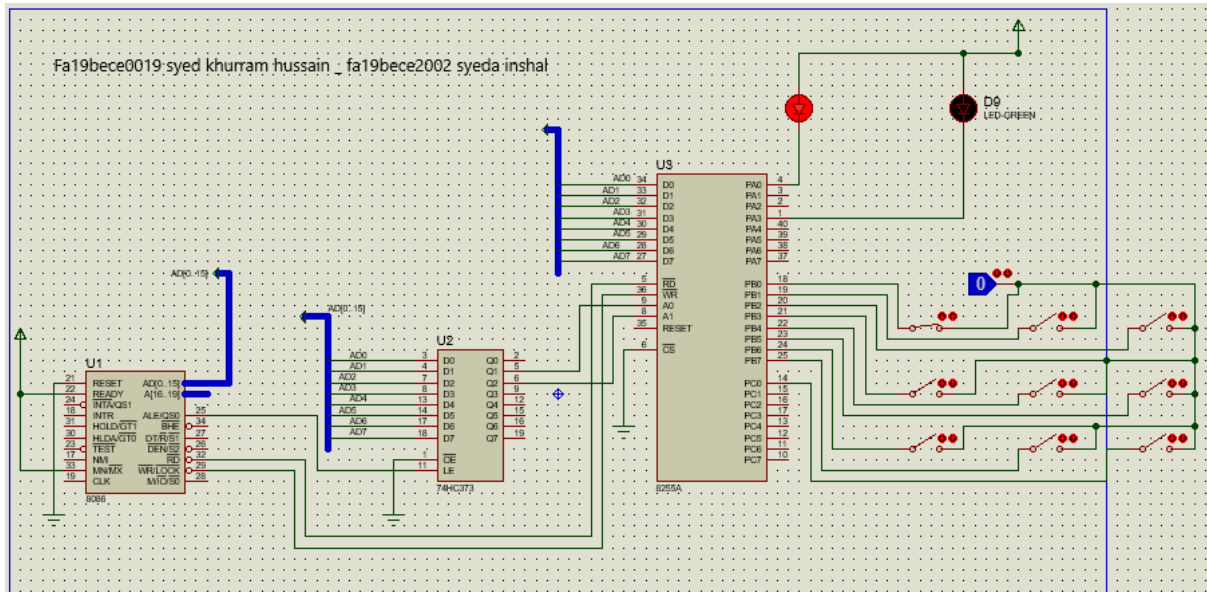
Methodology

3.1. Flow of Program

Once the circuit is ON, based on configuration, Port A is set to output, Port B is set to Input and Port C also. Two LEDs connected to Port A indication of correct and wrong password which the green LED can be replaced by an electric lock or relay for further implementation of door lock. 8 switches connected to Port B and one connected to Port B getting input based on user's choice.

The password to access the user is internally set and once the user selected switches matches the green LED will turn on indicating correct entry else Red LED.

3.1.1. Code

```
DATA SEGMENT
      PORTA EQU 00H
      PORTB EQU 02H
      PORTC EQU 04H
      PORT_CON EQU 06H
      DATA ENDS
CODE SEGMENT
   MOV AX,DATA
   MOV DS, AX
   ORG 0000H
START:

      MOV DX, PORT_CON
      MOV AL, 10000011B; port C (INPUT), port A (output) in mode 0 and PORT B (INPUT) in mode 0
      OUT DX, AL
      MOV AL, 11111111b
      MOV DX, PORTA
      OUT DX,AL

XX:

      MOV DX, PORTB
      IN AL, DX

      CMP AL, 11011010B;1 3 6
      JE lock_on

      CMP AL,11111111B
      JE led_off
```

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```
        JNE led_red


lock_on:
        MOV AL, 11110111B
        MOV DX, PORTA
        OUT DX,AL
        JMP XX
led_red:
        MOV AL, 11111110B
        MOV DX, PORTA
        OUT DX,AL
        JMP XX
led_off:
        MOV AL, 11111111B
        MOV DX, PORTA
        OUT DX,AL
        JMP XX

CODE ENDS
END
```
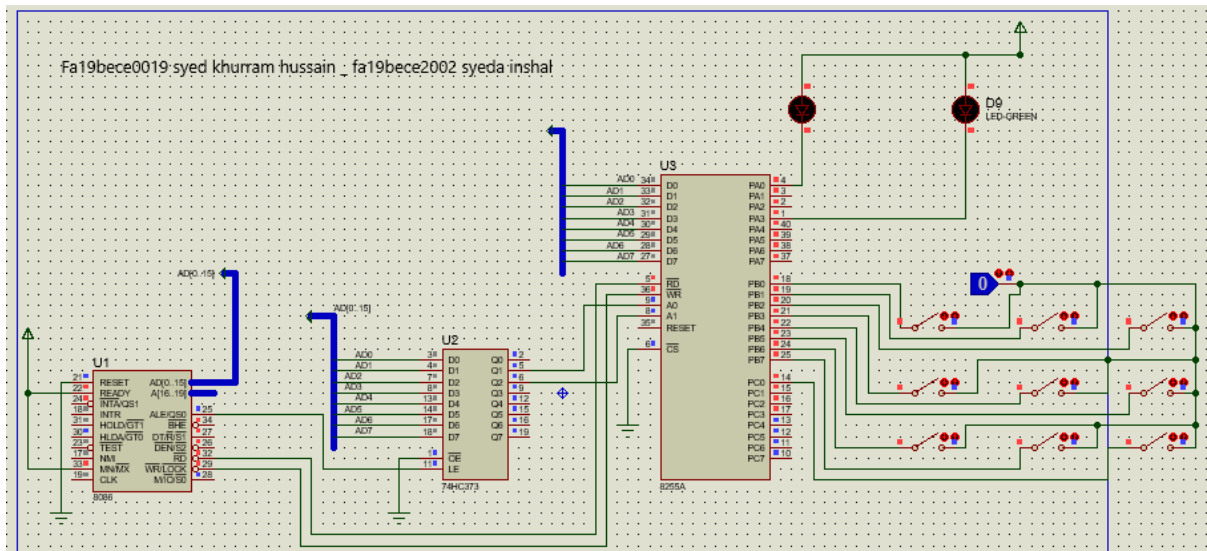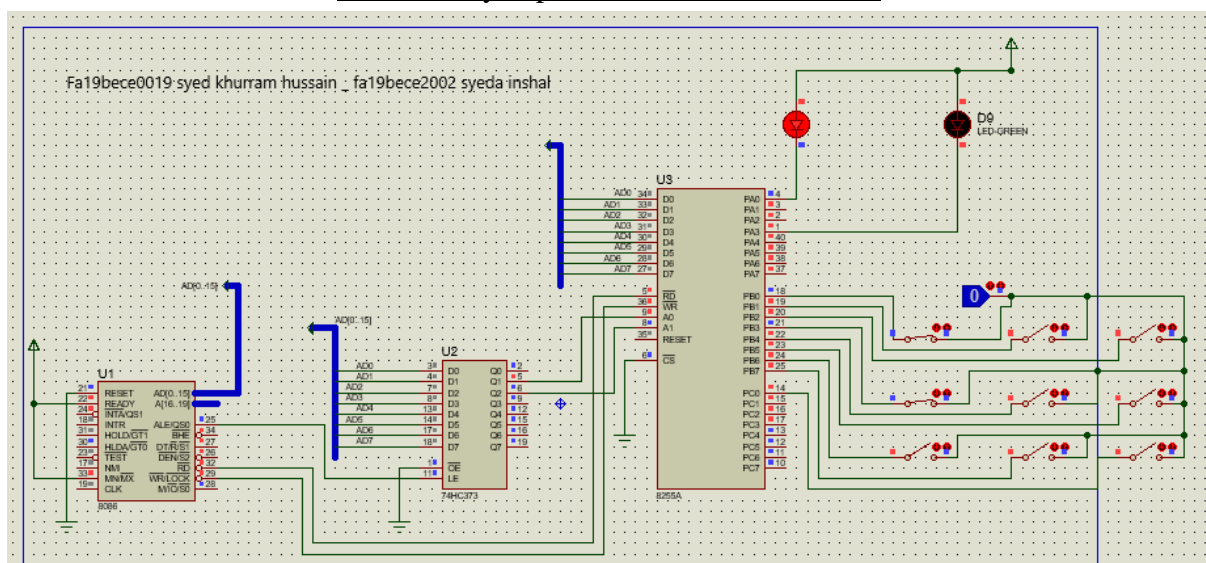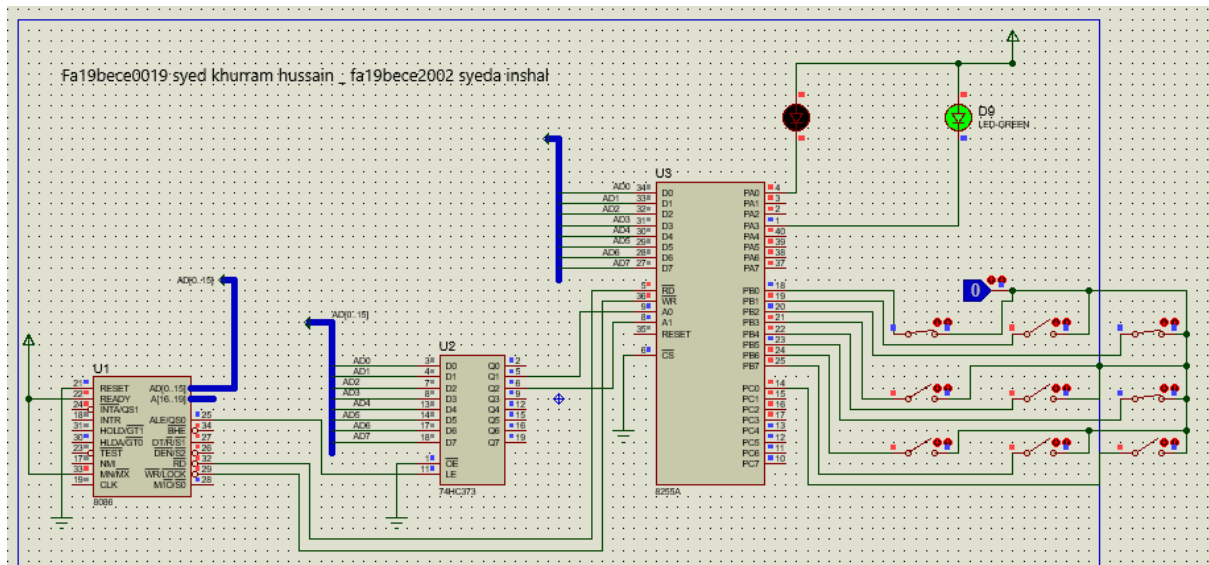
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Results

As this project is implemented in simulation below are the results:

Once no key is pressed both LEDs are off.

Once any key/keys pressed rather than correct pass Red LED is on.

Once correct config of keys/password is selected [as in this circuit is 1-3-6] Green LED is on.

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Conclusion

The security of this project is 9*9*9 = 729 which would take days to break it in randomly testing every combination. To further secure this project to $9^{9^9} = 1.966\ldots e + 77$ which would take years to test all combination should use step by step key selection in this way that only 2^{nd} switch entry is acceptable if 1^{st} is correct means although password is 136 but user should first select 1 then 3 and then 6 but in normal way even selection of 631 will also open the door.

Another additional feature should be alternate to reset password or another backup password in order to change or access the door in case of forgetting password or to add/change the password.

There could be also option for delaying after inputting multiple wrong entries.

References

References and websites used to get assistance to create this project:

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6. Assembly Language for x86 Processors by Kip Irvine, 7e