EAST WEST UNIVERSITY

Project Report

Microprocessor-based automatic door opener

Course Code: CSE360

Course Title: Computer Architecture

Section: 1

Submission Date: 7/01/2022

Objective:

An automatic door opening system is a simple system to open and close a door automatically. The goal is to design an automatic door system using an 8051 microcontroller and PIR or Passive Infra-red sensor where the PIR sensor can detect the infrared radiation from humans to open and close the door automatically.

Theory:

The need for automatic gates has increased in recent times. The system described in the project includes the use of a microcontroller to achieve the objectives of this project. It uses a sensor to avoid the pressure of opening and closing the gate manually. Because of this technology, we do not need gate manning by humans. The automatic door system includes a passive infrared sensor (PIR sensor), an AT89C51 microcontroller (8051), an L293D motor driver, a motor, and a power supply.

As a monitoring and control system, the microcontroller was used to read data values from input devices and communicate with the outside world. In the microcontroller 8051 Pins, 1 to 8 are the PORT 1 Pins. PORT 1 Pins consists of 8 – bit bidirectional Input / Output Port. there are other pins that handle different things like pin 9 is used for reset operations.

The PIR (passive infrared) sensor has a 3-pin connection. Pin 1 is the Vcc pin. It must be connected to a 5V supply. Pin 2 is the Data Out pin. Pin 3 is the Ground pin. It must be connected to the ground. The range of this sensor is 30 feet. It can be reduced to 15 feet using a jumper. in the software version, there is another pin named test pin to test the circuit functionality.

It is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low current control signal and provide a higher current signal which drives the motors. in the motor driver Enable 1,2 pin enables the input pin Input 1(2) and Input 2(7). Pin 8, Vcc2 (Vs) Connected to Voltage pin for running motors (4.5V to 36V). and pin 16. pin 8, VSS Connected to +5V to enable IC (integrated circuit chip) function. Output (1,2) pins are used to connect with the motor.

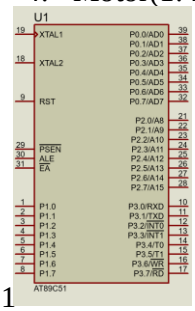
Design

Hardware:

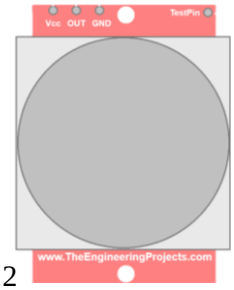
In haradware we have to use sensor that can detect people when they infront of them. And we need a microcontroller then can take that data and give command to open or close door. When we are going to close or open door we need a motor to do that. And a motor controller to control the motor.

I think this below component full-fill our criteria.

1. AT89C51(1.1)
2. PIR Sensor(1.2)
3. L293D(1.3)
4. Motor(1.4)



1.1



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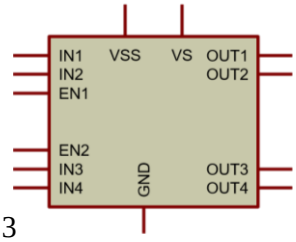

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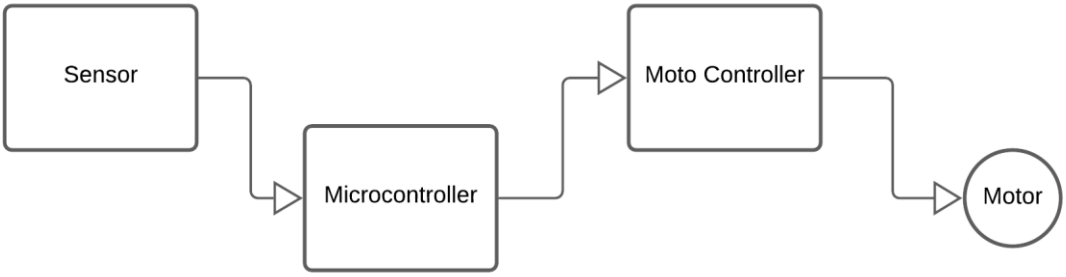
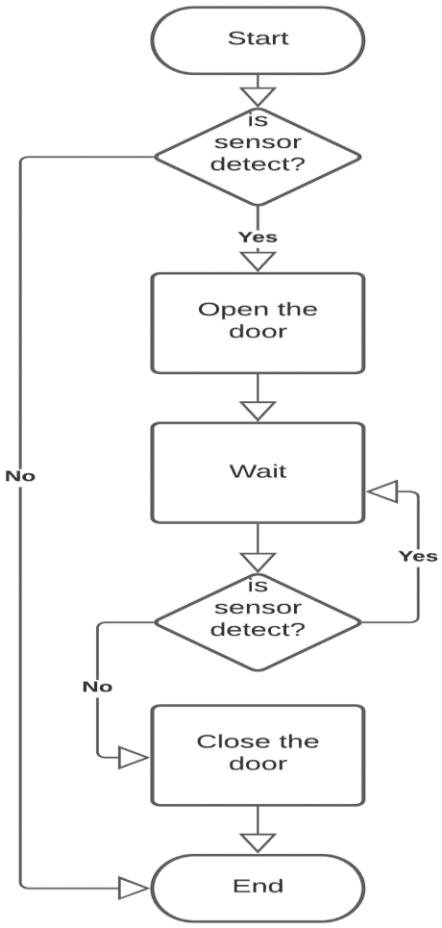


here we can see how the hardware is working. PIR sensor sending data to AT89C51 microcontroller then the microcontroller sending signal accoriding to that data to L293D motor controller then the motro controller excute motor accoriding to that signal.

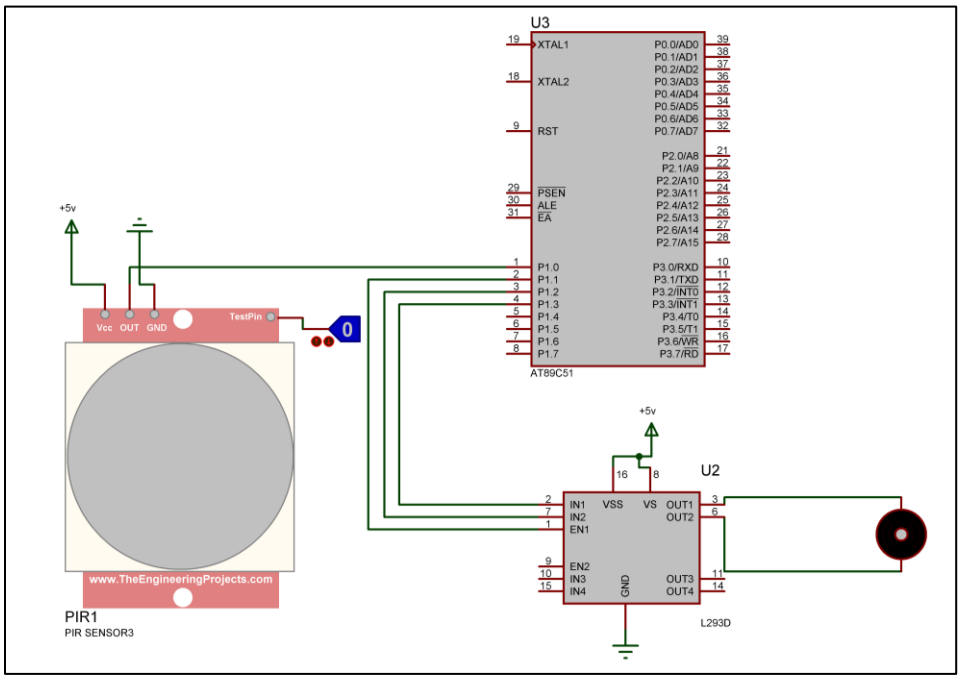
Software:

we need do design set of instruction for microcontroller so it can accept the sensor data and send signal to motor through motor controller. Below we have a block diagram about how the circuit going to work. We can use this flow chart to design our software



Implementation

Hardware:



This is the circuit we design for automatic door open or close. Below demonstration for this circuit.

PIR sensor's OUT pin connect P1.0 pin of AT89C51. If PIR sensor detect something then it will send a signal to AT89C5. Then AT89C51 will enable L293D through P1.1 to EN1. Then microcontroller's port 1.2 and 1.3 to will send signal to L293D for rotating motor.

Software:

```
1.  #include <reg51.h>
2.
3.  sbit p10 = P1 ^ 0;
4.  sbit p11 = P1 ^ 1;
5.  sbit p12 = P1 ^ 2;
6.  sbit p13 = P1 ^ 3;
7.  int gateStatus = 0;
8.  void delay1();
9.  void delay2();
10. void main(void) {
11.   while (1) {
12.     Delay1();
13.     if (p10 == 1 && gateStatus == 0) {
14.       p11 = 1;
15.       p12 = 0;
16.       p13 = 1;
17.       delay2();
18.       gateStatus = 1;
19.     } else if (p10 == 0 && gateStatus == 1) {
20.       p11 = 1;
21.       p12 = 1;
22.       p13 = 0;
23.       delay2();
24.       gateStatus = 0;
25.       p11 = 0;
26.     } else if (p10 == 1 && gateStatus == 1) {
27.       p11 = 0;
28.       p12 = 0;
29.       p13 = 0;
30.     }
31.
32.   }
33. }
34.
35. void delay1() {
36.   int i, j;
37.   for (i = 0; i < 10; i++) {
38.     for (j = 0; j < 10000; j++) {}
39.   }
40. }
41. void delay2() {
42.   int i, j, f = 0;
43.   for (i = 0; i < 10; i++) {
44.     for (j = 0; j < 30000; j++) {}
45.   }
46. }
47.
```

Here is the instruction inside AT89C51 microcontroller. Inside the code we use reg51.h because this microcontroller is based on 8051. With *sbit* we are assign port to a variable. Here, p10 is connect to sensor and p11, p12, p13 is connected to EN1, IN2, IN1 of motor controller. In this line 11 to 32 is going to repeat until we stop this circuit. Inside *while* loop we divided gate status 3 part.

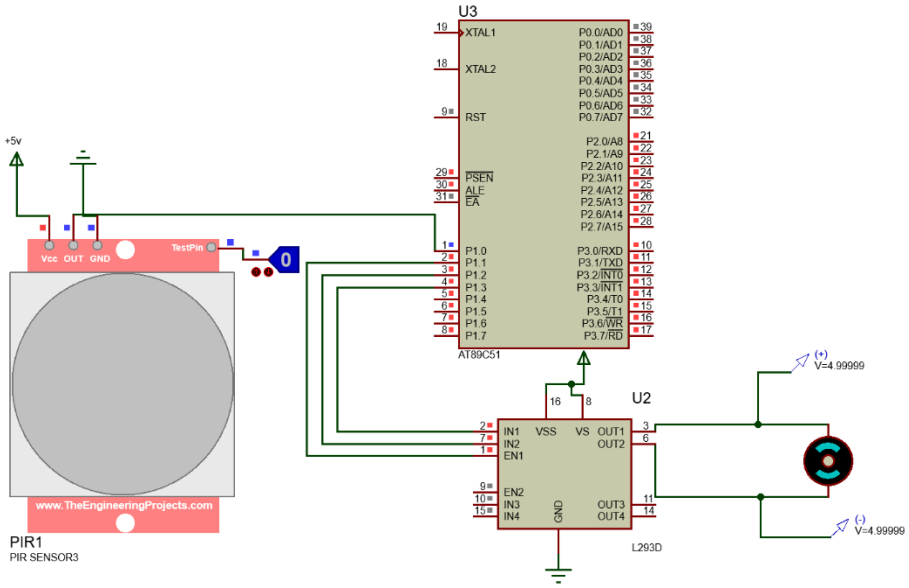
1. Someone at the door and the door is close as p10=1 and gateStatus=0
2. Someone not at the door and the door is open as p10=0 and gateStatus=1
3. Someone at the door and the door is open as p10=1 and gateStatus=1

Here we used two delay method first one is for sensor. Sensor take some micro second to detect things and sending signal. And the second one for opening and closing door.

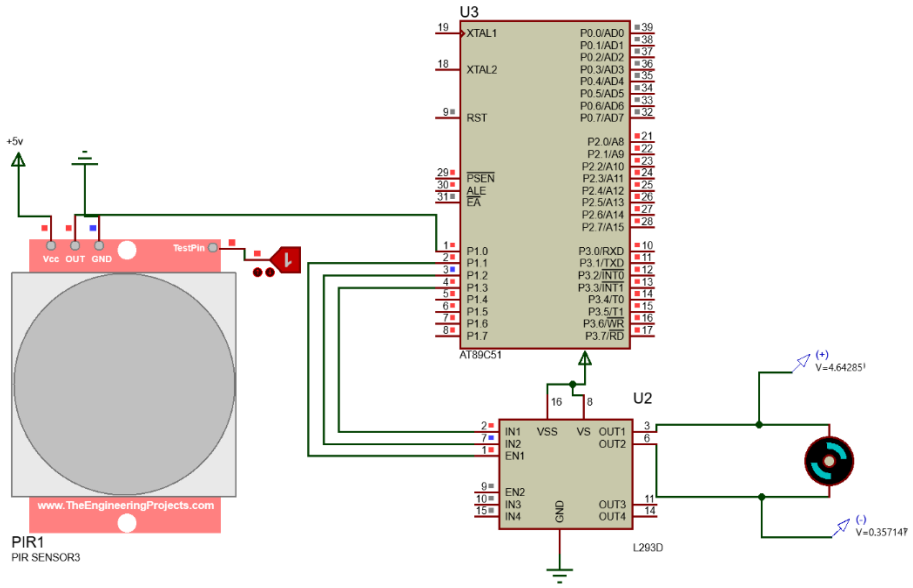
If someone at the door then gate will open and hang until they move from sensor.

Debugging-Test-run

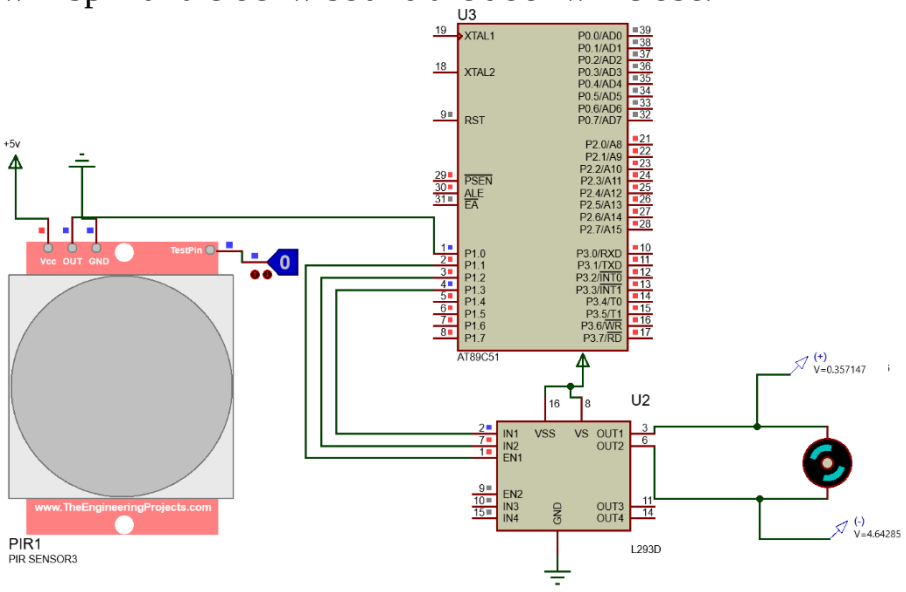
This is the very first state of the circuit. if we see the sensor we can see the test pin 0 that's why voltage across the motor are equal so the motor cannot spin.



Now when the sensor detect something motor will start spin clockwise and open the door. In this case when test pin 1 we can see that motor's positive side has more voltage then the negetive side that means the motor is spinig clockwise.



If object move from the sensor, then the door will close. As we can see the test pin 0 and the positive voltage is less then the negative voltage that means the motor will spin anti clockwise and the door will close.



Conclusion and Future Improvements:

The construction of an automated door system had been achieved in this project. This design can be easily adapted to any electric gate and any form of control that requires the use of sensors. The Design includes the basic sensor characteristics, microcontroller input and output interfacing, and C language principles. There is total agreement between the system design and the required operation of the system.

we can use this system in many places. Since the door is opened only when a person is detected and remains close all other times, it can save a lot of energy in the form of air conditioning. An automatic door system with sliding doors can be useful for the aged and disabled. It can make our work easier.

Every good project has limitations; like it needs electrical energy to operate. If we are out of power supply, we have to open the door manually. we only can use the system in public sectors like offices front-doors, supermarkets, etc., as it cannot provide security. It is also pricy than normal doors and needs maintenance.

The automatic gate is not a security device and should not be construed as one. It provides convenient access. Overall, it is a good system to make our daily life a bit easier. But we can update the system in the future. We can add a lock system, camera set up, other new features for security purposes, more effective sensors to detect objects. Along with this system, we can use Face-detection through Camera for Automated Attendance System can be used. Upgrading the system using higher bit microprocessors for speed optimization.

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