STP-IV Project Report

{TE B Computer Engineering }

Automatic Door Opener using

Arduino and PIR Sensor

Name : Tormal Shubham Baban TEB:77

Seat : T150424422 PRN: 71824879B

Name : Desai Prathamesh Shivaji TEB:69

Seat : T150424367 PRN :71824641B

Contents

3.5 Arduino Code

3.6 Observation

3.7 Discussion

1 Introduction

1.1 Arduino

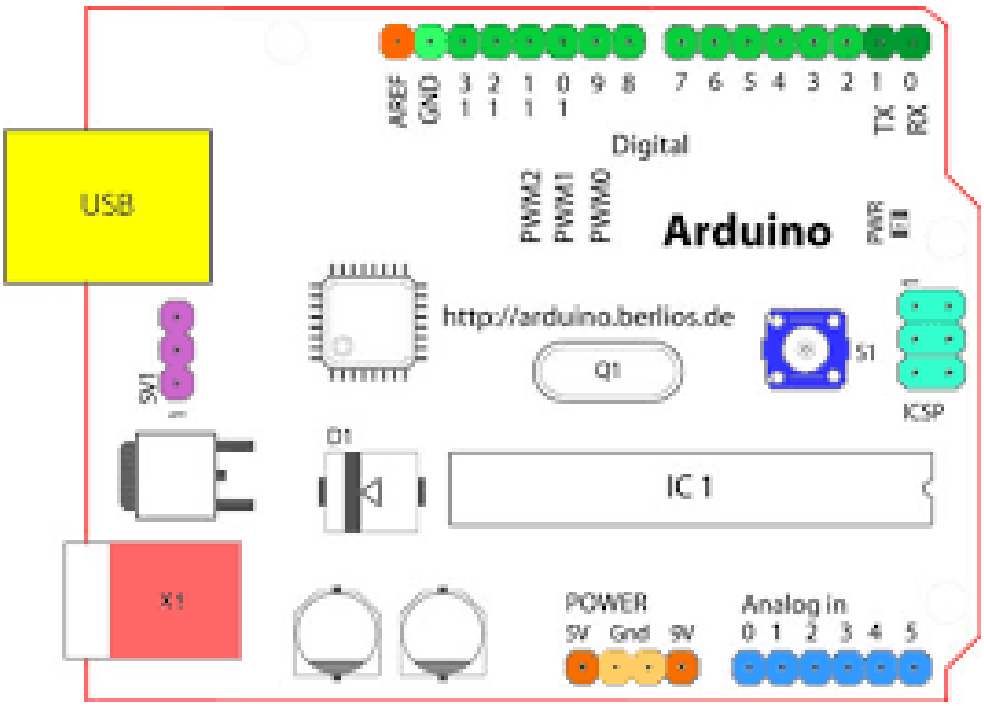
Arduino comprises of both a physical programmable circuit board (commonly known as a microcontroller) and a

programming software, or IDE (Integrated Development Environment) that can be run on a PC, used to compose and transfer PC code to the circuit board. It can be done by using the

Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Pro- cessing. Unlike other programmable circuit boards, the Arduino does not require a dierent equipment (called a software engineer) to upload code to the circuit board, one can essentially utilize a USB link. Also, the Arduino IDE utilizes a rearranged rendition of C++, making it simpler to gure out how to program. In a word, Arduino make the functions of the micro-controller into a more accessible package. The Uno is one of the more prevalent boards in the Arduino family and an extraordinary option for the beginners.

1.2 Common Components of Arduino Boards

There are different types of Arduino boards for different purposes. But all the boards have the majority of following components in common.



Starting clockwise from the top center: [1]

- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital Pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out - TX/RX (dark green) - These pins cannot be used for digital
- i/o (digitalRead and digitalWrite) if serial communication is also being used (e.g. Serial.begin).
- Reset Button - S1 (dark blue)
- In-circuit Serial Programmer (blue-green)
- Analog In Pins 0-5 (light blue)
- Power and Ground Pins (power: orange, grounds: light orange)
- External Power Supply In (9-12VDC) - X1 (pink)
- Toggles External Power and USB Power (place jumper on two pins closest to desired supply) -

SV1 (purple)

- USB (used for uploading sketches to the board and for serial communication between the board and the computer; can be used to power the board (yellow)

Digital Pins

The digital pins on an Arduino board can be used for general purpose input and output via the pin-

1. Mode(), digitalRead(), and digitalWrite() commands. Each pin has an internal pull-up resistor which
2. can be turned on and off using digitalWrite() (w/ a value of HIGH or LOW, respectively) when the
3. pin is con gured as an input.
4. Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data.
5. External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low
6. value, a rising or falling edge, or a change in value.
7. PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function. On
8. boards with an ATmega8, PWM output is available only on pins 9, 10, and 11.

Analog Pins

1. The analog input pins support 10-bit analog-to-digital conversion (ADC) using the analogRead()
2. function. Most of the analog inputs can also be used as digital pins: analog input 0 as digital pin 14
3. through analog input 5 as digital pin 19.

Power Pins

- 9V: The input voltage to the Arduino board when it's using an external power source (as opposed
- to 5 volts from the USB connection or other regulated power source). Different boards accept
- different input voltages ranges.
- 5V: The regulated power supply used to power the microcontroller and other components on
- the board. This can come either from VIN via an on-board regulator, or be supplied by USB or
- another regulated 5V supply.
- 3V3: (Diecimila-only) A 3.3 volt supply generated by the on-board FTDI chip. [1]
- GND: Ground pins.

2 Components Description

2.1 Arduino UNO

- The Uno is one of the most popular Arduino boards. It consists of 14-digital I/O pins, where 6-pins
- can be used as PWM(pulse width modulation outputs), 6-analog inputs, a reset button, a power jack,
- a USB connection and more. It includes everything required to hold up the microcontroller; simply
- attach it to a PC with the help of a USB cable and give the supply to get started with a AC-to-DC
- adapter or battery.

2.2 Breadboard

- A breadboard is a construction base for prototyping of electronics. In the 1970s the solderless bread-
- board (a.k.a. plugboard, a terminal array board) became available and nowadays the term "bread-
- board" is commonly used to refer to these. Because the solderless breadboard does not require
- soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experiment-
- ing with circuit design. For this reason, solderless breadboards are also popular with students and
- in technological education. A variety of electronic systems may be prototyped by using breadboards,
- from small analog and digital circuits to complete central processing units (CPUs).

2.3 DC Motor

- DC motor is any of a class of rotary electrical machines that converts direct current electrical energy
- into mechanical energy. The most common types rely on the forces produced by magnetic elds.
- Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic,
- to periodically change the direction of current
- ow in part of the motor. A DC motor's speed can
- be controlled over a wide range, using either a variable supply voltage or by changing the strength of
- current in its eld windings. Small DC motors are used in tools, toys, and appliances. The universal
- motor can operate on direct current but is a lightweight brushed motor used for portable power tools
- and appliances.

2.4 Servo Motor

- A servomotor is a rotary actuator or linear actuator. It can precisely control angular or linear position,

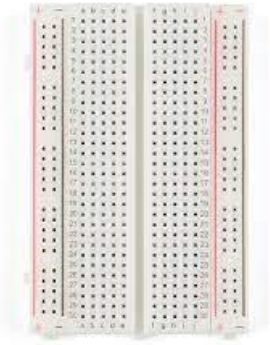
- velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

- It also requires a relatively sophisticated controller, often a dedicated module designed speci cally for use with servomotors.

2.5 Transistor

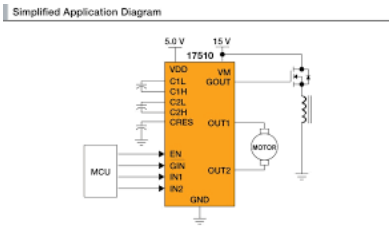
- A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power.
- It is composed of semiconductor material usually with at least three terminals for connection to an
- external circuit. A voltage or current applied to one pair of the transistor's terminals controls the
- current through another pair of terminals. Because the controlled (output) power can be higher than
- the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged
- individually, but many more are found embedded in integrated circuits.

1.Arduino Uno



2.BreadBoard

3. DC Motor



4.H-Bridge

5.Transister

6.Potentiometer

7.Servomotor

8. 9V Battery

2.6 H-bridge

- An bridge is an integrated circuit (IC) that switches the polarity of a voltage applied to a load. These
- circuits are often used in robotics and other applications to allow DC motors to run forwards or
- backwards. Most DC-to-AC converters (power inverters), most AC/AC converters, the DC-to-DC
- push{pull converter, most motor controllers, and many other kinds of power electronics use H bridges.
- In particular, a bipolar stepper motor is almost invariably driven by a motor controller containing two H bridges.

2.7 Potentiometer

- A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable
- voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor
- or rheostat. The measuring instrument called a potentiometer is essentially a voltage divider used
- for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name.

2.8 External Power Source

- For stand-alone operation, the board is powered by a battery rather than through the USB connection

- to the computer. While the external power can be anywhere in the range of 6 to 24 V (for example,

- you could use a car battery), a standard 9 V battery is convenient. While you could jam the leads

- of a battery snap into the Vin and Gnd connections on the board, it is better to connect the battery

- snap leads to a DC power plug and connect to the power jack on the board

2.9 Arduino Software

- The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board.

- The environment is written in Java and based on Processing and other open-source software.

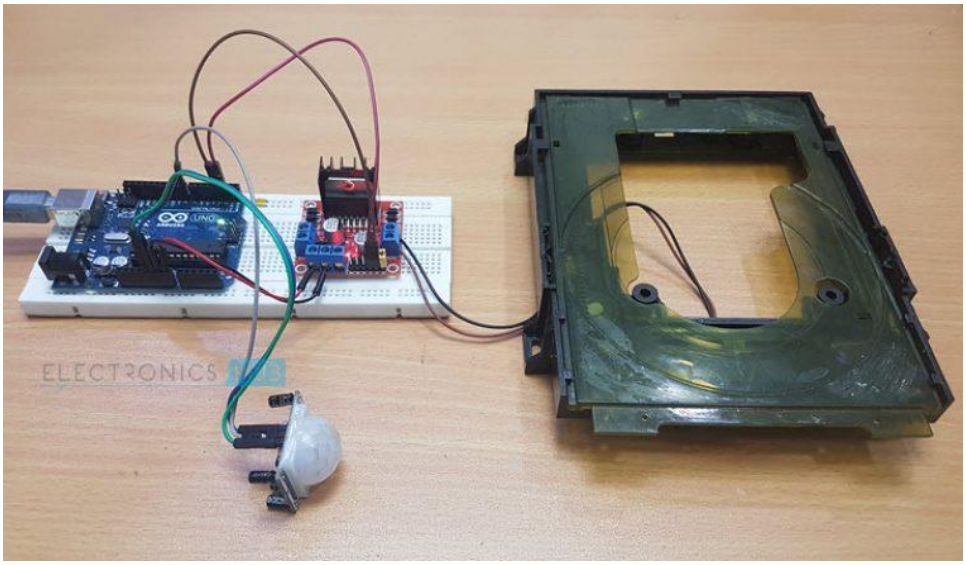
- software can be used with any Arduino board.

3. Project

3.1 Objective

An Automatic Door Opener System is a simple project based on PIR Sensor and Arduino, which automatically opens and closes the door by detecting a person or object.

3.2 Components Required for Automatic Door Opener System

- Arduino UNO
- PIR Sensor
- L298N Motor Driver Module
- CD Tray with 5V Motor
- Breadboard
- Connecting Wires
- Power Supply
- 

3.3 Component Description

Arduino UNO

In this project, Arduino UNO acts as the main controlling part. It reads the data from the PIR Sensor and activates the L298N Motor Driver based on the data from the PIR Sensor

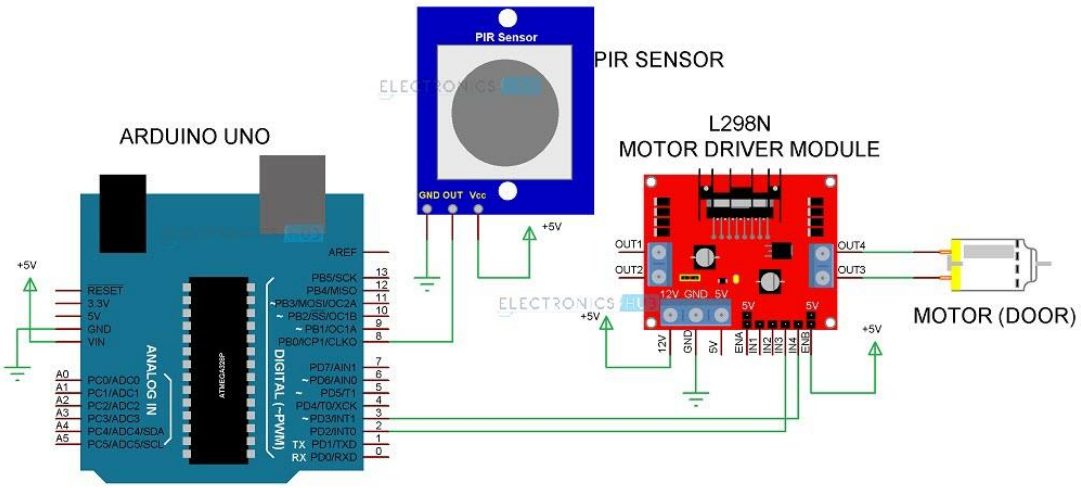
PIR Sensor

Detecting human motion is done with the help of PIR Sensor.

L298N Motor Driver Module

Motor Driver is an important part of the project as it is responsible for driving the motor of the door (CD Tray Motor in this case). In this project, we have used the very common and very popular L298N Motor Driver Module.

3.3Circuit Diagram of Automatic Door Opener System



3.4 Circuit Design

- First, the Data OUT of the PIR Sensor is connected to Digital Pin 8 of Arduino. The other two pins of PIR Sensor i.e. Vs and GND are connected to +5V and GND respectively.

- Coming to the Motor Driver, we have used the second channel of the L298N Motor Driver Module. Hence, the IN3 and IN4 of the L298N Motor Driver are connected to Digital Pins 2 and 3 of Arduino.

- The Enable Pin of the Second Motor on the L298N Module us connected to +5V. Usually, all the L298N Modules consists of a

jumper to directly connected the Enable pins to +5V. You can use this option.

- Since the motor used in the project is a 5V Motor, I've connected a 5V Supply to the Motor Driver Module.

- Finally, the Motor of the CD Tray is connected to the OUT3 and OUT4 of L298N Motor Driver Module.

3.5 Code

```
int in1 = 2;
int in2 = 3;
int sensor = 8;
int led = 13;

void setup()
{
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(sensor, INPUT);
pinMode(led, OUTPUT);

digitalWrite(in1,LOW);
digitalWrite(in2,LOW);
//digitalWrite(sensor,LOW);
digitalWrite(led,LOW);

while(millis()<13000)
{
digitalWrite(led,HIGH);
```

```
delay(50);
digitalWrite(led,LOW);
delay(50);
}
digitalWrite(led,LOW);
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);

}

void loop()
{
if(digitalRead(sensor)==HIGH)
{
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
digitalWrite(led,HIGH);
delay(2000);
digitalWrite(in1,LOW);
digitalWrite(in2,LOW);

digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
digitalWrite(led,LOW);
delay(2000);
digitalWrite(in1,LOW);
digitalWrite(in2,LOW);

}

}
```

Working of Automatic Door Opener System

- The working of the Automatic Door Opener System using Arduino and PIR Sensor is very simple. This project can be considered as an extension of Arduino PIR Sensor Tutorial and Arduino L298N DC Motor Control Tutorial.

- When the PIR Sensor detects any motion of a person, its Data OUT Pin will become HIGH. As this pin is connected to the Arduino, it will detect this HIGH Signal and understands that there is person approaching the door.

- Arduino then immediately activates the L298N Motor Driver module to open the door. After some time (about 2 to 5 seconds in this project), the Arduino will once again activate the Motor Drive to close the door.

Applications

- Arduino based Automatic Door Opener System is a very useful project as it enables you to understand the concept of such automatic door opener systems and how they work.

- These systems are already being used in many places like malls, theatres and hospitals.

- You can implement this Arduino based project at you home in Garage Door Openers, toilet cover openers, Office door openers, etc.

Conclusion:

An Automatic Door Opener System is a simple project based on PIR Sensor and Arduino, which automatically opens and closes the door by detecting a person or object.

You might have seen Automatic Door Opener Systems at shopping malls, cinemas, hospitals etc. where, as soon as a person approaches the door (at about 2 or 3 feet), the door automatically slides open. And after some time (about 5 to 10 seconds), the door closes by sliding in the reverse direction.

Such Automatic Door Opener Systems are very useful as you do not need a person to standby the door and open it whenever a guest comes. Also, since the doors are opened and closed only when a person approaches the door, there is significantly less loss of air conditioning.

So, in order to understand the potential of this concept, we have implemented a simple Automatic Door Opener System using Arduino and PIR Sensor.

*****End