ARDUINO CAR PARKING SYSTEM

DONE BY,

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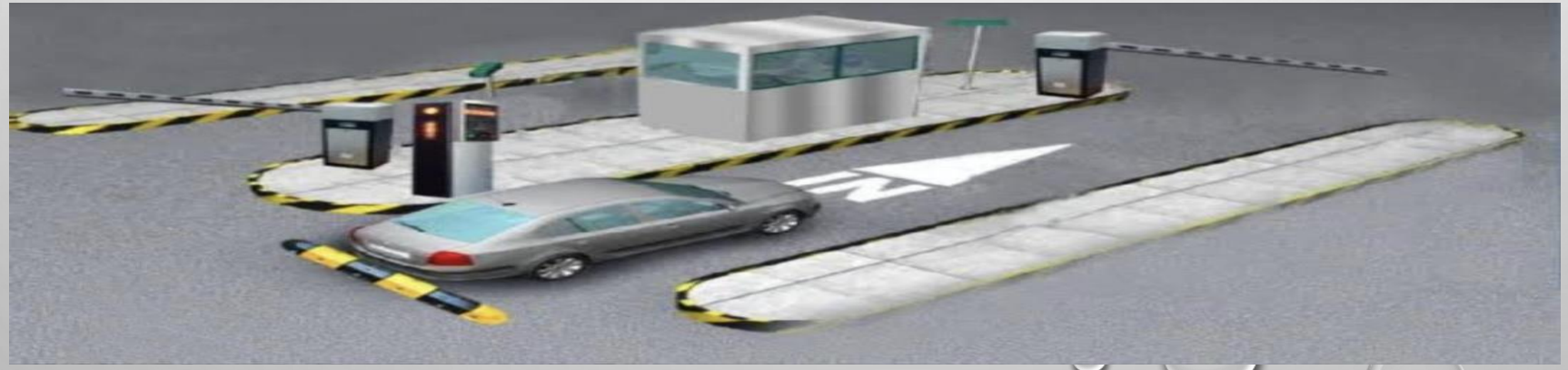
INTRODUCTION

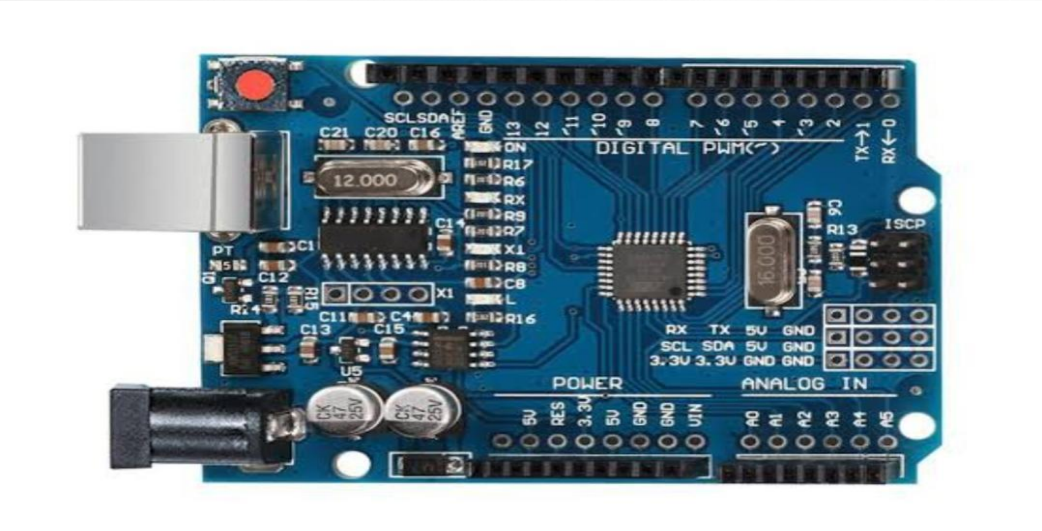
- OUR TEAM IS PLEASED TO PRESENT OUR PROJECT ON TOLL GATE AUTOMATION USING AN ARDUINO UNO BOARD, LCD I2C DISPLAY, SERVO MOTOR, AND IR PROXIMITY SENSORS. THE PRIMARY OBJECTIVE OF THIS PROJECT IS TO ENHANCE THE EFFICIENCY AND RELIABILITY OF TOLL COLLECTION SYSTEMS.
- IN THIS PROJECT, IR PROXIMITY SENSORS ARE EMPLOYED TO DETECT VEHICLES APPROACHING THE TOLL GATE, ENSURING PRECISE AND TIMELY OPERATION. THE SERVO MOTOR AUTOMATES THE OPENING AND CLOSING OF THE GATE, THEREBY MINIMIZING THE NEED FOR MANUAL INTERVENTION AND REDUCING POTENTIAL ERRORS. ADDITIONALLY, THE LCD I2C DISPLAY PROVIDES REAL-TIME FEEDBACK, MAKING THE SYSTEM MORE USER-FRIENDLY FOR BOTH TOLL OPERATORS AND DRIVERS.
- THROUGH THIS PROJECT, WE AIM TO DEMONSTRATE THE POTENTIAL OF INTEGRATING SIMPLE ELECTRONIC COMPONENTS TO SOLVE PRACTICAL PROBLEMS AND IMPROVE EXISTING SYSTEMS. THE FOLLOWING SECTIONS WILL DETAIL THE DESIGN, IMPLEMENTATION, AND TESTING PHASES OF OUR TOLL GATE AUTOMATION SYSTEM.

AIM

- THE TOLL GATE AUTOMATION PROJECT IS DESIGNED TO STREAMLINE THE PROCESS OF TOLL COLLECTION BY INTEGRATING SEVERAL KEY ELECTRONIC COMPONENTS: AN ARDUINO UNO BOARD, AN LCD I2C DISPLAY, A SERVO MOTOR, AND IR PROXIMITY SENSORS.
- THE PRIMARY GOAL IS TO CREATE AN EFFICIENT, AUTOMATED SYSTEM THAT REDUCES HUMAN INTERVENTION AND ENHANCES THE ACCURACY AND SPEED OF TOLL OPERATIONS



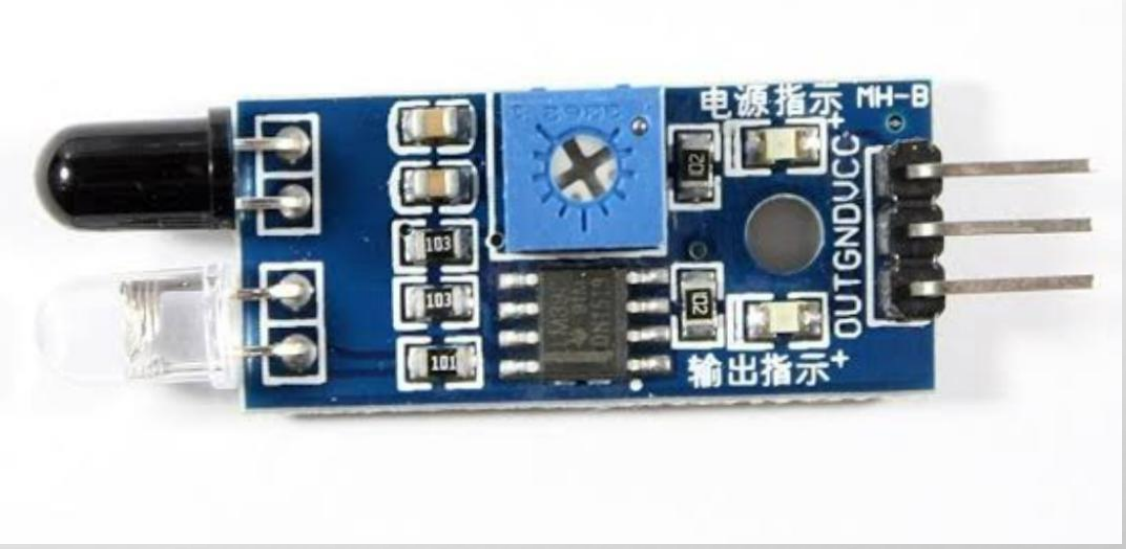
MAIN COMPONENTS USED:



Arduino UNO Board

LCD i2C Displays

Servo Motor



IR Proximity Sensors

COMPONENT DESCRIPTION

IR Transmitter

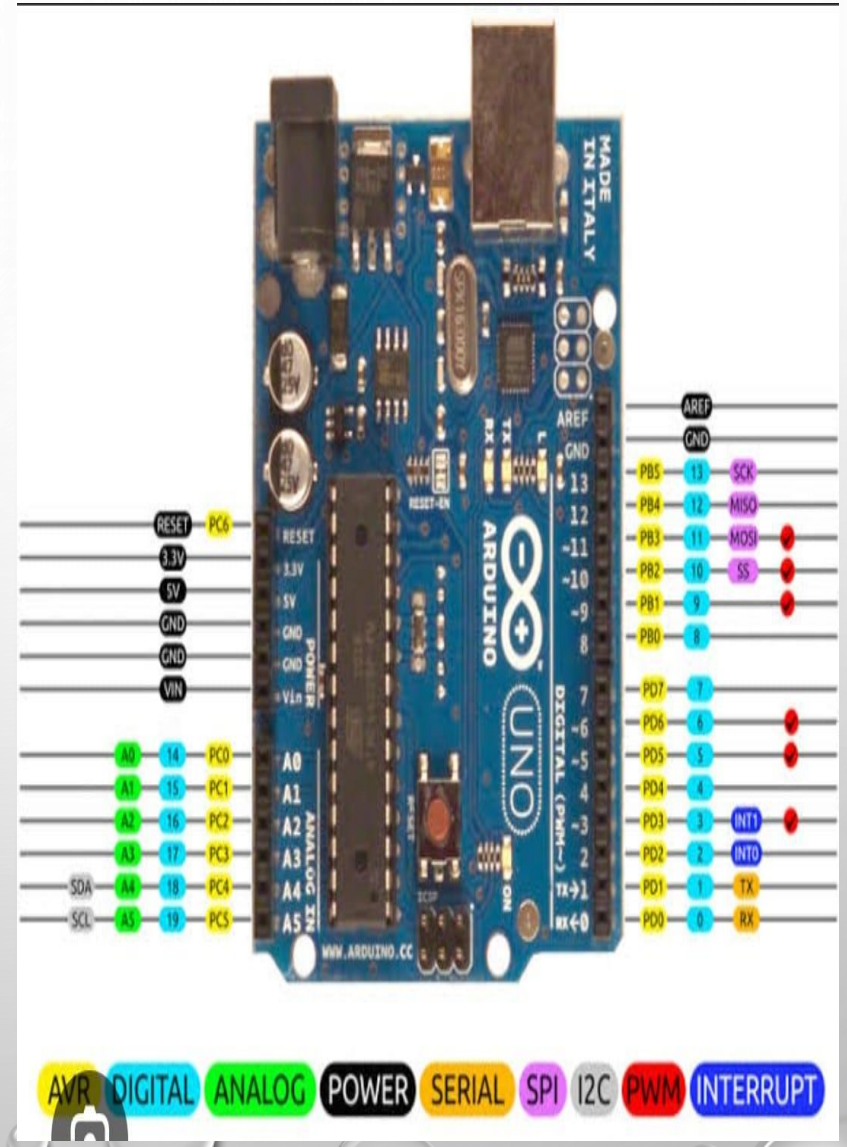
- For transmitting IR LED of wavelength 940 nm to 950 nm are commonly used.
- This IR LED transmits the data from one end to and at another end there is an IR receiver to receive the data.

IR LED Transmitter

IR Receiver TSOP1738

- At the receiver end, the IR receiver receives data at 38kHz of the carrier frequency.
- Mainly, TSOP Receiver is use to receive data which support various transmitted code.
- The data rate of TSOP1738 is up to 2400 bps.

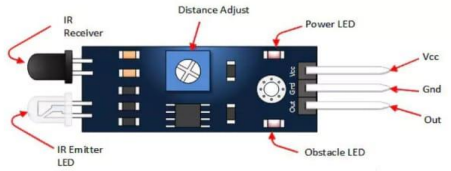
TSOP1738



COMPONENTS DESCRIPTION

Arduino Uno Specification

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Inout Voltage (limit): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins: 6
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328P)
- EEPROM: 1 KB (ATmega328P)
- Clock Speed: 16 MHz
- LED_BUILTIN: 13
- Length: 68.6 mm
- Width: 58.4 mm
- Weight: 25 g



Pin Description

Vcc	3.3 to 5 Vdc Supply Input
GND	Ground Input
Out	The output that goes low when an obstacle is in range
Power LED	Illuminates when power is applied
Obstacle LED	Illuminates when an obstacle is detected
IR Emitter	Infrared emitter LED
IR Receiver	The infrared receiver that receives signal transmitted by Infrared emitter.

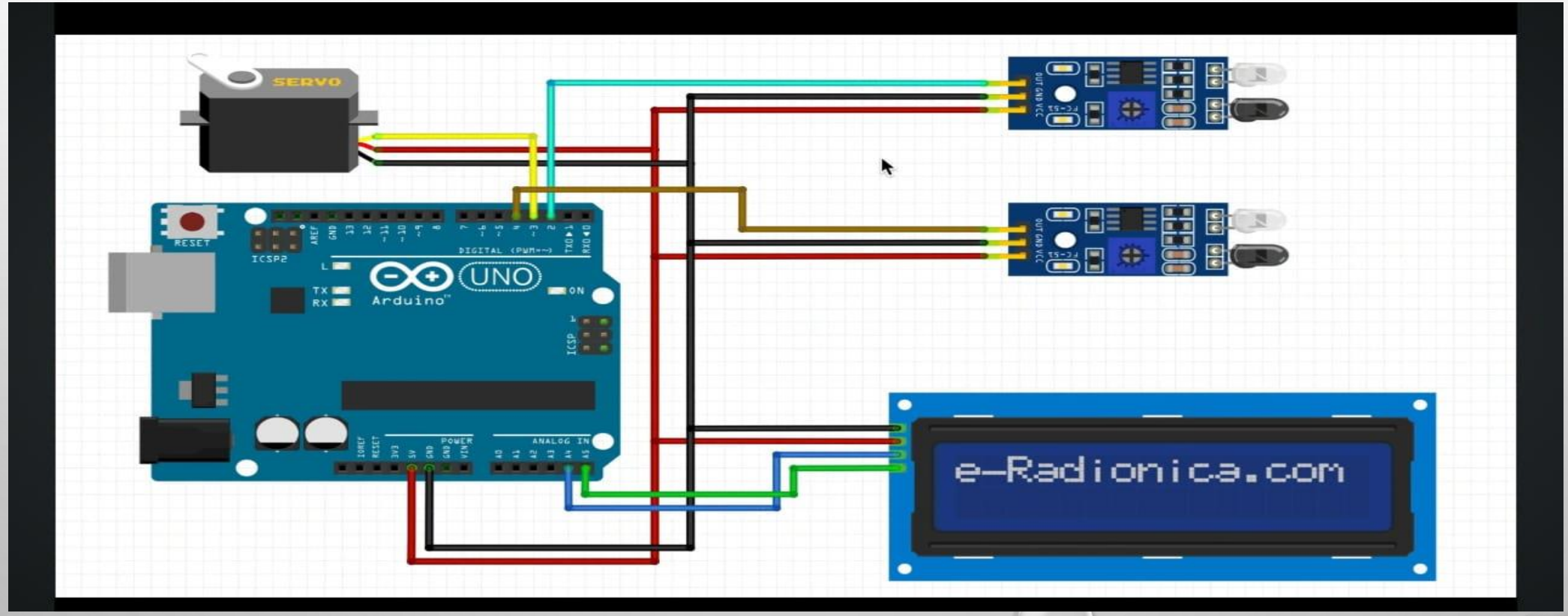
Wire Number	Wire Colour	Description
1	Brown	Ground wire connected to the ground of system
2	Red	Powers the motor typically +5V is used
3	Orange	PWM signal is given in through this wire to drive the motor

TowerPro SG-90 Features

- Operating Voltage is +5V typically
- Torque: 2.5kg/cm
- Operating speed is 0.1s/60°
- Gear Type: Plastic
- Rotation : 0°-180°
- Weight of motor : 9gm
- Package includes gear horns and screws

Board Size	3.2 x 1.4cm
Working voltage	3.3 to 5V DC
Operating voltage	3.3V: ~23 mA, to 5V: ~43 mA
Detection range	2cm – 30cm (Adjustable using potentiometer)
Active output level	The output is "0" (Low) when an obstacle is detected

CIRCUIT DIAGRAM (CONNECTIONS)



CODE USED:

LCD16x2_I2C_Scanner

```
// Viral Science www.viralsciencecreativity.com www.youtube.com/c/viralscience
// Arduino 16x2 LCD I2C Scanner
/*
Analog Pin 4 - SDA
Analog pin 5 - SCL
5V  - Vcc
GND - GND
*/

#include <Wire.h>
void setup()
{
Wire.begin();
Serial.begin(9600);
Serial.println("\nI2C Scanner");
}
void loop()
{
byte error, address;
int Devices;
Serial.println("Scanning...");
Devices = 0;
for(address = 1; address < 127; address++ )
{

Wire.beginTransmission(address);
error = Wire.endTransmission();
if (error == 0)
{
Serial.print("I2C device found at address 0x");
```

Car_Parking_System

```
void loop(){

if(digitalRead (IR1) == LOW && flag1==0){
if(Slot>0){flag1=1;
if(flag2==0){myservo1.write(0); Slot = Slot-1;}
}else{
lcd.setCursor (0,0);
lcd.print("    SORRY :(    ");
lcd.setCursor (0,1);
lcd.print("  Parking Full  ");
delay (3000);
lcd.clear();
}
}

if(digitalRead (IR2) == LOW && flag2==0){flag2=1;
if(flag1==0){myservo1.write(0); Slot = Slot+1;}
}

if(flag1==1 && flag2==1){
delay (1000);
myservo1.write(100);
flag1=0, flag2=0;
}

lcd.setCursor (0,0);
lcd.print("    WELCOME!    ");
lcd.setCursor (0,1);
lcd.print("Slot Left: ");
```

Car_Parking_System

```
// Viral Science www.viralsciencecreativity.com www.youtube.com/c/viralscience
// Arduino Car Parking System

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x3F,16,2);  //Change the HEX address
#include <Servo.h>

Servo myservo1;

int IR1 = 2;
int IR2 = 4;

int Slot = 4;           //Enter Total number of parking Slots

int flag1 = 0;
int flag2 = 0;

void setup() {
  lcd.begin();
  lcd.backlight();
pinMode(IR1, INPUT);
pinMode(IR2, INPUT);

myservo1.attach(3);
myservo1.write(100);

lcd.setCursor (0,0);
lcd.print("    ARDUINO    ");
lcd.setCursor (0,1);
```

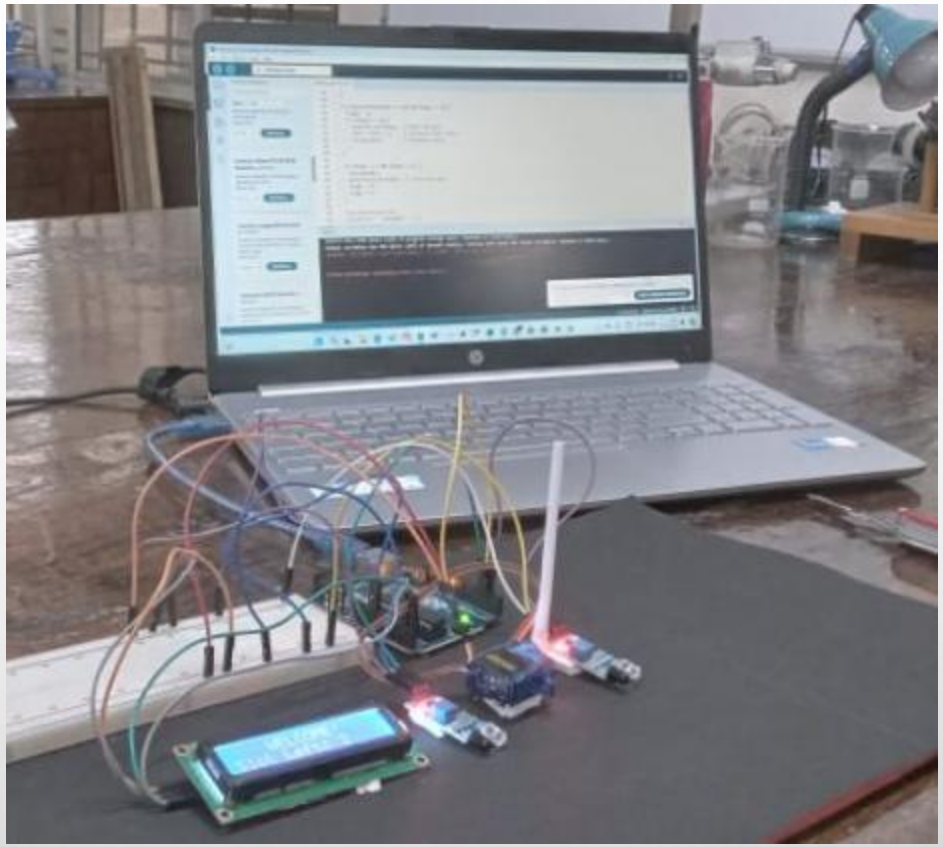
ADVANTAGES:

- **INCREASED EFFICIENCY**: FASTER TOLL COLLECTION, REDUCED WAIT TIMES
- **ENHANCED ACCURACY**: MINIMIZES HUMAN ERROR WITH PRECISE DETECTION.COST-EFFECTIVE: LOWERS OPERATIONAL COSTS BY REDUCING MANUAL LABOR
- **IMPROVED SAFETY**: REDUCES HUMAN INTERVENTION, LOWERING ACCIDENT RISK
- **REAL-TIME FEEDBACK**: PROVIDES IMMEDIATE INFORMATION VIA LCD DISPLAY.
- **SCALABILITY**:EASY SCALABLE AND MODIFIABLE FOR VARIOUS NEEDS.
- **CONSISTENT OPERATION**: RELIABLE PERFORMANCE, UNAFFECTED BY HUMAN FACTORS.

DISADVANTAGES

- **INITIAL COST:** HIGH SETUP COSTS FOR HARDWARE AND IMPLEMENTATION
- **MAINTENANCE:** REGULAR UPKEEP NEEDED FOR SENSORS AND MECHANICAL PARTS.
- **TECHNICAL ISSUES:** POTENTIAL FOR SENSOR MALFUNCTIONS AND SOFTWARE BUGS
- **LIMITED FLEXIBILITY:** MAY STRUGGLE WITH UNEXPECTED SITUATIONS
- **POWER DEPENDENCE:** REQUIRES A CONSISTENT POWER SUPPLY
- **ENVIRONMENTAL FACTORS:** ADVERSE WEATHER CAN AFFECT SENSOR ACCURACY.
- **SECURITY CONCERNS:** VULNERABLE TO HACKING, REQUIRING ROBUST SECURITY MEASURES.

Final Project:



Thank you