Smart Parking System using Arduino

1. Introduction

This project implements a smart parking system using Arduino. It detects car presence in two parking slots and controls entry/exit barriers automatically while displaying slot availability on an LCD screen.

2. Key Components

- Arduino Uno (or compatible board)

- 16x2 LCD Display

- 2 Servo Motors (for entry and exit gates)

- 4 IR Sensors (for entry, exit, and parking slots)

- Jumper Wires

- Breadboard

3. Working Principle

- IR sensors detect the presence of a vehicle at each parking slot and at the entry/exit points.

- Based on sensor input, the Arduino updates slot status (Available/Not Available) on the LCD.

- If a vehicle is detected at the entry, the entry gate servo rotates to allow passage.

- If a vehicle is detected at the exit, the exit gate servo rotates to allow exit.

- When slots are full, the system can be enhanced to prevent further entry.

4. Circuit Overview

- Connect IR sensors to digital pins: IR_Slot1 → 7, IR_Slot2 → 8, IR_entry → 6, IR_exit → 13

- Connect Servo motors to pins: Entry gate (S1) → 10, Exit gate (S2) → 9

- Connect LCD as:

- - - RS → 12, E → 11, D4 → 5, D5 → 4, D6 → 3, D7 → 2
  - Provide 5V and GND to all components appropriately using the Arduino power pins.

5. Code

```
/*Code written by -

Fuad Hasan

BME, KUET

*/


/*Smart Parking System*/


#include <LiquidCrystal.h>

#include <Servo.h>


Servo S1, S2;


#define IR_Slot1 7

#define IR_Slot2 8

#define IR_entry 6

#define IR_exit 13


int pos=0;

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);


void setup()

{

  S1.attach(10);
```

```arduino
  S2.attach(9);


  S1.write(pos);

  S2.write(pos);


  pinMode(IR_Slot1, INPUT);

  pinMode(IR_Slot2, INPUT);

  pinMode(IR_entry, INPUT);

  pinMode(IR_exit, INPUT);


  lcd.begin(16, 2);

  lcd.print(" Smart Parking " );

  lcd.setCursor(0,1);

  lcd.print("\tSystem");

  delay(2000);

  lcd.clear();

  lcd.setCursor(0,0);

  lcd.print("Slot 1 = A");

  lcd.setCursor(0,1);

  lcd.print("Slot 2 = A");

  delay(2000);
}

void loop()
{
  if(digitalRead(IR_Slot1)==HIGH)
```

```
{
 lcd.setCursor(0, 0);

 lcd.print("Slot 1 = NA");

}

else

{
 lcd.setCursor(0, 0);

 lcd.print("Slot 1 = A ");

}


if(digitalRead(IR_Slot2) == HIGH)

{
 lcd.setCursor(0,1);

 lcd.print("Slot 2 = NA");

}

else

{
 lcd.setCursor(0,1);

 lcd.print("Slot 2 = A ");

}


if(digitalRead(IR_entry) == HIGH)

{
 S1.write(pos+90);

}

else
```

```
{

  S1.write(pos);

}


if(digitalRead(IR_exit) == HIGH)

{

  S2.write(pos+90);

}

else

{

  S2.write(pos);

 }

}
```

6. Code Explanation

- **Library Inclusion:**
    - LiquidCrystal.h for LCD control
    - Servo.h to manage servo motors
- **Servo Initialization:**
    - S1 and S2 control entry and exit gates
- **IR Sensor Input Pins:**
    - Slots: pin 7 and 8
    - Entry and Exit: pin 6 and 13
- **LCD Setup:**
    - Displays project title then initial slot status (all available)
- **Loop Function:**
    - Checks each IR sensor:

- Updates LCD status of each parking slot

- Moves entry servo (S1) when vehicle is detected

- Moves exit servo (S2) similarly

7. Conclusion

The Smart Parking System efficiently tracks available slots and manages gate operations automatically. This project is scalable and forms the basis for automated parking management in real-life scenarios like malls, offices, and airports.