SMART PARKING SYSTEM

A MINI-PROJECT REPORT

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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LIST OF ABBREVIATION

ABBREVIATION	ACCRONYM
IR - Sensor	Infra-Red Sensor
LCD	Liquid Crystal Display
I2C - Module	Inter Integrated Circuit
RFID	Radio Frequency Identification

ABSTRACT

This project introduces an advanced parking management system by using Arduino and infrared sensor technology. The system automates parking slot allocation and monitoring processes, enhancing efficiency and user experience. Utilizing Arduino as the central control unit, along with strategically placed infrared sensors, the system detects vehicle presence and coordinates barrier operations accordingly. Upon vehicle detection by the first sensor, the system triggers the servo motor to open the barrier, allowing entry. Conversely, when the vehicle departs, sensed by the second sensor, the system promptly closes the barrier, signaling slot availability. This automation reduces human intervention, minimizing errors and ensuring seamless operation. Furthermore, real-time monitoring capabilities empower administrators with valuable insights into parking occupancy trends, facilitating informed decision-making. Ultimately, our solution streamlines parking procedures, optimizing space utilization, and providing a user-friendly experience for both drivers and parking facility managers.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The project “SMART PARKING SYSTEM” presents a solution for the parking space problems faced in urban cities especially metropolitan cities. By harnessing the power of Arduino, this project uses two infrared sensors in order to manage the vehicle traffic in and out of the system providing efficient monitoring for the facility managers as well as drivers.

1.2 SCOPE OF THE WORK

The “SMART PARKING SYSTEM” has tremendous scope especially in cities where the population density is high. In such metropolitan cities, where the drivers usually find hard to find a parking space, usage of this system can bridge the gap as based on the number of slots available, the drivers can look for alternatives.

1.3 PROBLEM STATEMENT

Urban parking management faces challenges of inefficiency and congestion due to manual slot allocation and limited monitoring capabilities. Current systems lack automation, leading to frustration among drivers and inefficient space utilization. Our project addresses this by developing a Smart Parking System taking advantage of Arduino and infrared sensors. The system aims to automate parking slot allocation, provide real-time availability information, and enhance user experience for both drivers and facility managers. By offering seamless integration of hardware and software solutions, our system strives to alleviate parking challenges and optimize space utilization in urban environments.

1.4 AIM AND OBJECTIVES OF THE PROJECT

Our project aims to develop a Smart Parking System using Arduino and infrared sensors to transform urban parking management by automating slot allocation, enhancing real-time monitoring, and optimizing space utilization. Through automation, we seek to minimize human intervention and errors, streamlining the parking process for both drivers and facility managers. By providing accurate, real-time parking availability information via a user-friendly interface, we aim to improve user experience, reduce congestion, and maximize efficiency in parking facilities. The system will be designed for scalability, reliability, and seamless integration into existing infrastructure, supported by comprehensive documentation for deployment and maintenance, ensuring its effectiveness in addressing the evolving challenges of urban parking.

CHAPTER 2

LITERATURE SURVEY

This paper [1]proposes usage of RFID in car parking system to upgrade the user experience and elevate the control of parking cars in an efficient way. Using RFID introduces a lot more control and allow only authorized user to park their vehicle on the available space.

This research [2] paper provides a look about traditional parking methods and its difficulties in a way, which utilizes a lot of human labour. The proposed system in the paper reveals that to reduce the cost of implementing a IOT based parking system for vehicles, they have reduced the amount of sensors used into entry and exit sensor along with a slot counter to have a count of cars parked.

This project paper[3] identifies the problems of parking in smart city with enormous population and the project predicts that India will have 100 smart cities by 2030. The project utilizes a ultrasonic sensors for each parking slot and calculates the availability based on the sensor's output.

This research [4] focuses on parking detection using ultrasonic sensors for empty slots and passes on the information through internet using wifi modules. The paper has a very unique approach of tackling parking problem in large cities making it fully autonomous.

This study [5] notes existing problems in the manual parking system that involves lot of manual works and also prone to human errors in identifying empty parking slots. The proposed system seems to claim that the maintenance cost is low compared to other systems.

CHAPTER 3

SYSTEM SPECIFICATIONS

3.1 HARDWARE SPECIFICATIONS FOR APPLICATION

Processor	:	Pentium IV Or Higher
Memory Size	:	256 GB (Minimum)
HDD	:	40 GB (Minimum)

3.2 SOFTWARE SPECIFICATIONS

Operating System	:	WINDOWS 10 AND PLUS
Application	:	ARDUINO IDE

3.3 HARDWARE COMPONENTS FOR PROTOTYPE

Sensor	:	IR-Sensor
Board	:	Arduino Uno
Actuator	:	Micro Servo Motor 9g
Screen	:	16x2 LCD Display & I2C Module

CHAPTER 4

MODULES DESCRIPTION

Arduino Uno

This is microcontroller setup for the car parking system which acts as the CPU of the whole system. This takes inputs from the Sensors and triggers the actuators.

IR - Sensor

This sensor is used to trigger an event at the time of car's entry or exit and sends the information to the controller.

LCD Module

This module is used to notify about the availability of slots in the parking.

Servo Motor

This module is the actuator of the system which controls the gate based on the decisions taken by the controller of the system.

I2C Module

This is used as a communication medium between the LCD module and Controller just utilizing 4 pins from the controller whereas to connect LCD directly it needs more pins.

CHAPTER 5

SYSTEM DESIGN

5.1 FLOW CHART

A flowchart is a type of diagram that represents an algorithm, workflow or process. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem.

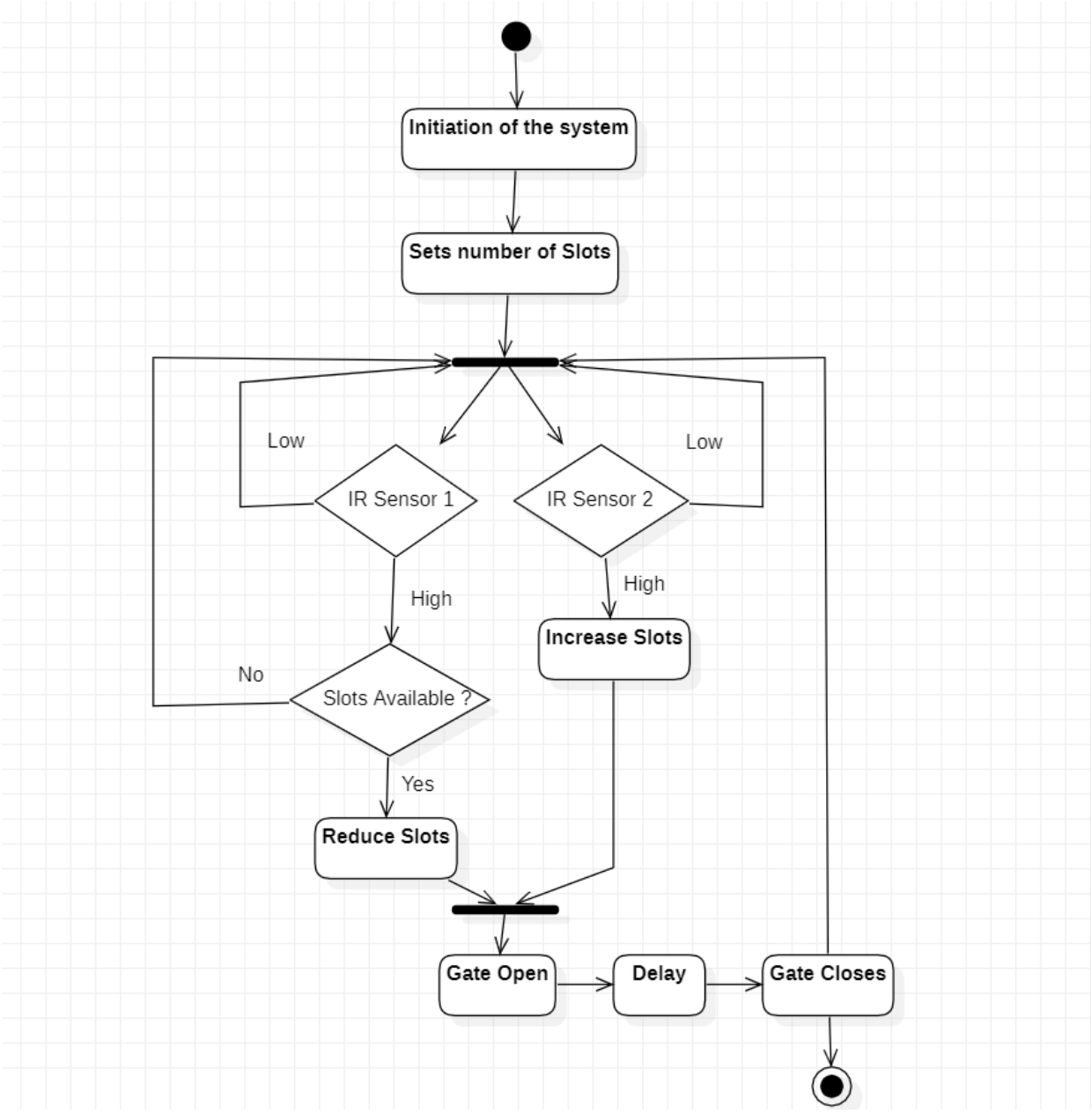

Figure 5.1 Flow Chart

5.2 CIRCUIT DIAGRAM

The circuit diagram explains the connections made with the hardware components and the board. The Arduino uno is connected with the breadboard as the VCC and GND are connected with the rails. The Sensors, LCD and Servo motor is given connection with the rails and the other input/output pins are connected to digital as per the requirements.

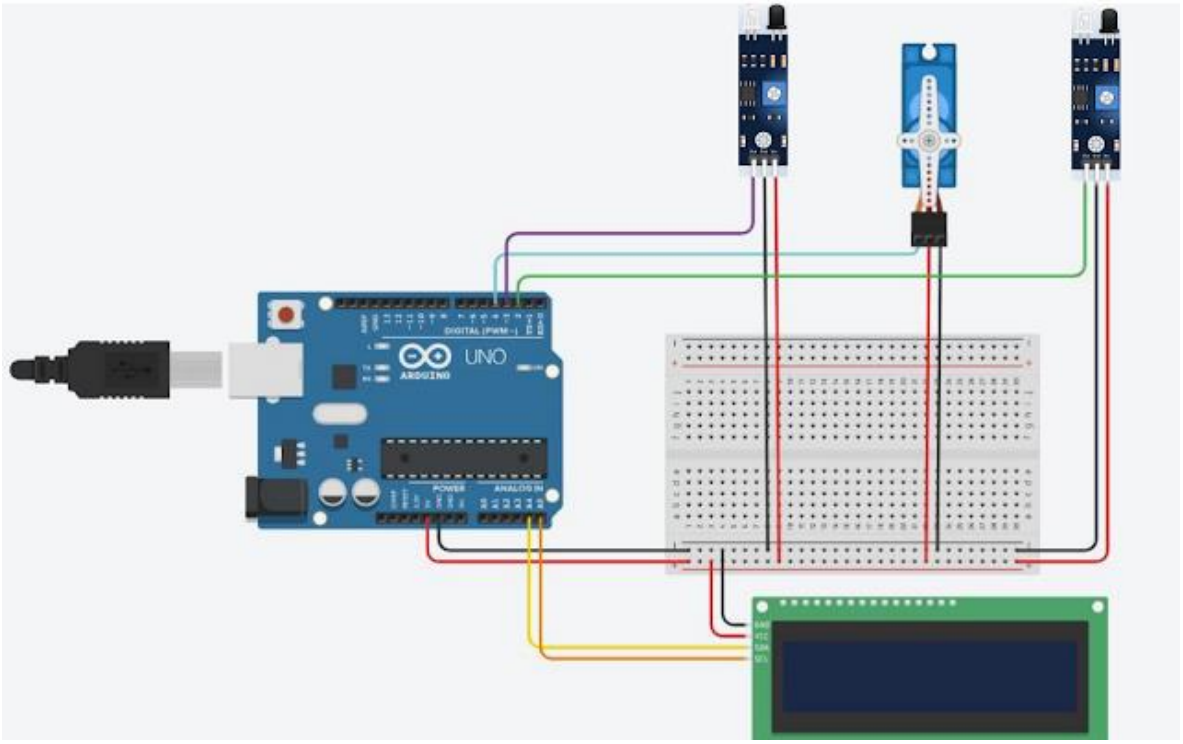

Figure 5.2 Circuit diagram

From the above figure 5.2, the connections are made

CHAPTER 6

CODING

1. **Setup**

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,16,2);
#include <Servo.h>

Servo myservo;

int IR1 = 2;
int IR2 = 3;

int Slot = 6;          //Total number of parking Slots

int flag1 = 0;
int flag2 = 0;

void setup() {
  Serial.begin(9600);
    lcd.init(); //initialize the lcd
    lcd.backlight(); //open the backlight


pinMode(IR1, INPUT);
pinMode(IR2, INPUT);

myservo.attach(4);
myservo.write(100);

lcd.setCursor (0,0);
lcd.print("     ARDUINO    ");
lcd.setCursor (0,1);
lcd.print(" PARKING SYSTEM ");
delay (2000);
lcd.clear();
}
```

2. Loop

```
void loop(){

if(digitalRead (IR1) == LOW && flag1==0){
if(Slot>0){flag1=1;
if(flag2==0){myservo.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){myservo.write(0); Slot = Slot+1;}
}

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

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

CHAPTER 7

SCREEN SHOTS

1. CONNECTION

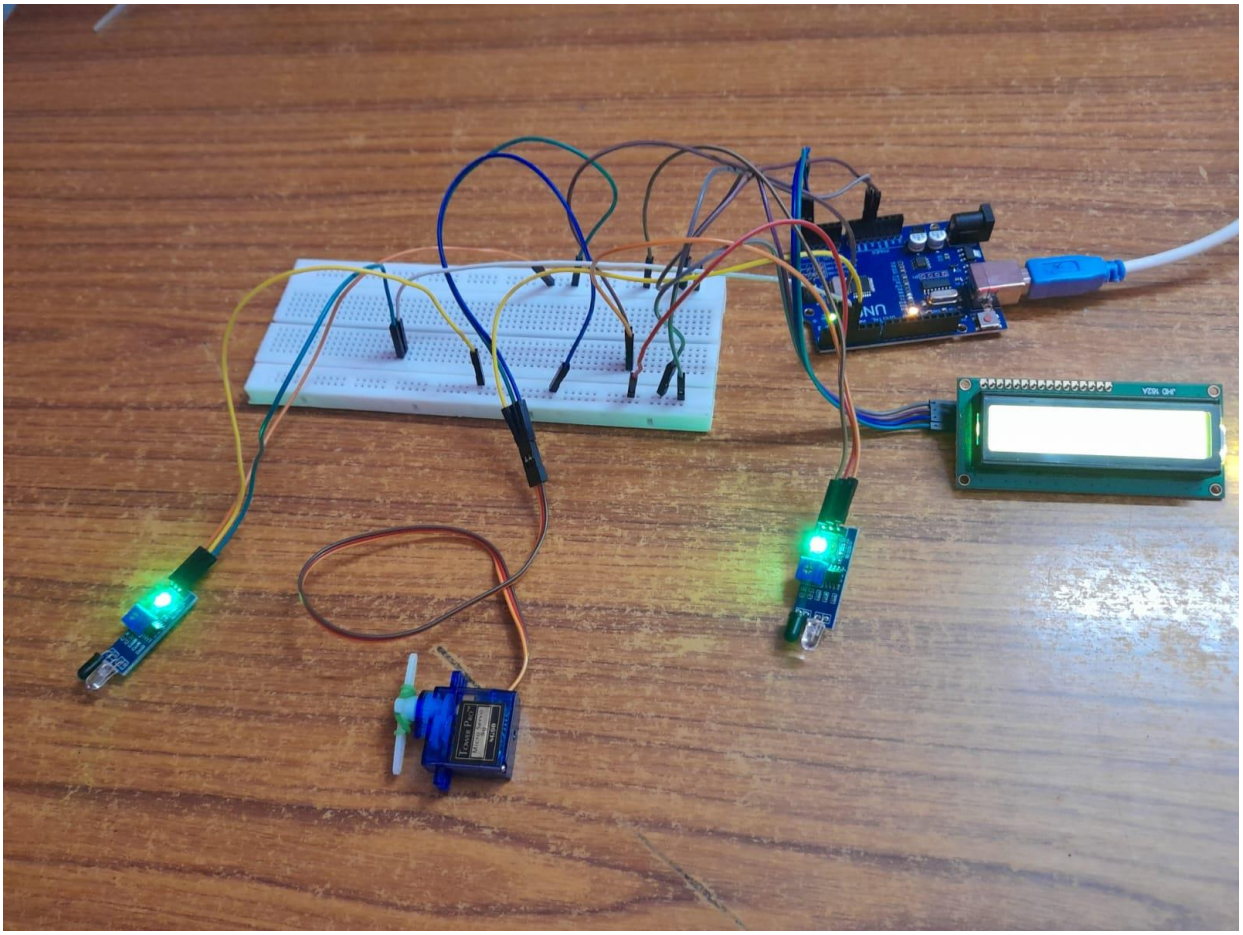

Figure 7.1 Connection Setup

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

In conclusion, the smart car parking system provides a best alternative solution for the manual car parking systems using cost effective measures and ensuring that the system works for perfection. This also have the capabilities to fulfil the requirements of great smart cities in general on the basis of parking. Implementing this system won't require much maintenance.

For future enhancements, the system for parking could be enlarged to multistorey parking. Each storeys's gateway can have a microcontroller along with sensors to multiply the original use of the system, The second feature to be added will be usage of RFID tags to allow only authorized cars or employing a payment system based on RFID within the cars. The next feature includes using a camera sensor to identify tags plastered on the car's windshield like fast tags to maintain pay and park systems.

REFERENCES

[1] RVS Technical Campus, IEEE Electron Devices Society, and Institute of Electrical and Electronics Engineers, *Proceedings of the Second International Conference on Electronics, Communication and Aerospace Technology (ICECA 2018) : 29-31, May 2018*.

[2] R. Widyasari, M. Z. Catur Candra, and S. Akbar, "IoT-based Smart Parking System Development," in *Proceedings of 2019 International Conference on Data and Software Engineering, ICoDSE 2019*, Institute of Electrical and Electronics Engineers Inc., Nov. 2019. doi: 10.1109/ICoDSE48700.2019.9092707.

[3] P. S. Patil, S. K. Padaganur, M. R. Gokak, N. D. Almel, B. Ayyangoudar, and K. Mirajkar, "IOT Based Car Parking," in *Proceedings of B-HTC 2020 - 1st IEEE Bangalore Humanitarian Technology Conference*, Institute of Electrical and Electronics Engineers Inc., Oct. 2020. doi: 10.1109/B-HTC50970.2020.9298002.

[4] G. Krasner and E. Katz, "Automatic parking identification and vehicle guidance with road awareness," in *2016 IEEE International Conference on the Science of Electrical Engineering, ICSEE 2016*, Institute of Electrical and Electronics Engineers Inc., Jan. 2017. doi: 10.1109/ICSEE.2016.7806133.

[5] A. Z. M. T. Kabir, N. D. Nath, F. Hasan, R. A. Utshaw, and L. Saha, "Automated Parking System with Fee Management Using Arduino."