Smart Car Parking System Design

Minor Project Report

Submitted for the partial fulfilment of the degree of

Bachelor of Technology

In

Electronics Engineering

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UNDER THE SUPERVISION AND GUIDANCE OF

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Deemed University
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ABSTRACT

More automobiles have made it more of an issue to park in the present metropolitan setting, which has generated traffic congestion, lost time, and increased levels of pollution. The intention of this Arduino Uno intelligent parking system design is to develop an efficient and friendly parking system. To sense automobiles in parking lots and report parking availability in real time, the system incorporates ultrasonic sensors. The users can quickly locate available parking spaces because the Arduino Uno processes sensor data which is then displayed on an LCD screen or wirelessly sent to a smartphone app. The system is designed to optimize parking space usage, minimize automobile emissions, and reduce search time for a parking space. The Smart Parking System is a cost-effective and scalable solution for future smart cities.

ACKNOWLEDGEMENT

I give thanks here in my heart to everyone who has encouraged me and led the way toward this project.

First and foremost, I am thankful to **Dr. R K Pandit, Vice-Chancellor** of Madhav Institute of Technology and Science, Deemed University, for giving me the opportunity to do this project and creating an academic environment that is very nurturing and gets better with research growth.

I am also thankful to have an opportunity to record my heartfelt thanks **to Dr.Manjaree Pandit, Dean(FoET).** Her continued encouragement and valuable advice helped shape the direction of this project during the course of my studies.

Special thanks should be given to the project guide, **Dr. Deepak Batham,** whom I have worked with sincerely and dedicated myself to and guided me regarding such a project's execution with correct insight and technical guidance throughout its development. His deep knowledge and constant encouragement have been vital to successfully completing this project. I am very thankful for the time and effort he dedicated to helping me realize this work's objectives. I would like to thank my friends, colleagues, and family members for their support and encouragement during the completion of this project.

Last but not least, I would thank the Madhav Institute of Technology and Science, Department of Electronics, for all that is required to successfully complete this project.

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CONTENT

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ACRONYMS

Acronym	Full Form
DC	Direct Current
AC	Alternating Current
IR	Infrared
IOT	Internet Of Things
LCD	Liquid Crystal display
LED	Light Emitting diode
IDE	Integrated Development Environment
MIPL	Mixed Integer Linear Program
RFID	Radio Frequency Identification
I^2C	Inter integrated circuit

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

In the fast-developing urban areas of today, parking has proven to be a significant problem caused by the ever-increasing number of vehicles and restricted parking areas. Conventional parking systems tend to cause wastage of time, traffic jams, and driver frustration. To counteract all these issues, smart parking systems are being created to maximize the utilization of existing parking spaces in an efficient manner. This project involves a Smart Parking System based on an Arduino Uno microcontroller. The system employs sensors to identify vehicles occupying parking spaces and send real-time information to users. It aims to make the parking management process automated by tracking the occupied status of all parking spaces and showing the information on an Liquid Crystal display(LCD) screen or through an application interface. Through the use of Arduino Uno's ease of use, low costs, and high flexibility, the suggested system has a cost-cutting solution, which can scale to be deployed in small-sized parking lots as well as more extensive commercial spaces. It benefits not only from enhanced user usability but also supports traffic congestion avoidance and environmental sensitivity.

CHAPTER 2: LITERATURE SURVEY

This chapter is a review of existing literature on the subject of autonomous robots, IoT integration, and computer vision as how other similar projects have explored these technologies.

1. A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies---This work presents an innovative algorithm which enhances the capability of existing cloud based smart parking system [1]and further constructs a network structure in accordance with the Internet of Things technology. This system assists the users to find an available parking space with less cost based on new performance metrics that is car matic. This metrics will calculate the user spaces in every car park. To improve the parking management, an intelligent parking system was designed which minimized the role of hiring individuals to keep the parking system. In this paper it suggests an effective cloud-based Smart parking system based on the Internet of Things. The information that contains the vehicle GPS location and distance between car parks and number of free parking space in car parks will be transmitted to the data center. Here the data centre is envisaged in the form of a cloud server that computes the fee of a user parking request and this data is updated periodically and made available to the vehicles on the network at any moment in time. In this system proposed, every car park is an IoT network and it stands alone as an independent car park. This paper utilizes a system model with wireless access in an open-sourced physical computing platform based on Arduino utilizing RFID technology. It utilizes smartphone that serves as the user interface between the cloud and the cars to verify the viability of the suggested system

2. A New "Smart Parking" System Based on Reservations and Optimal Resource Utilization[2]. This technology has a new smart parking system for cities. Depending on the user's proximity to the parking lot and parking cost, this system allocates and books a parking space for the driver. It also ensures that the whole parking capacity is utilized optimally. At each decision point in a time-driven process, their approach solves a Mixed Integer Linear Program (MILP) problem. There is a solution for each MILP that offers the best available allocation according to the user's status data at hand and also allows for arbitrary events such as requests from new users and availability of parking spots. To avoid potential conflicts with parking slot reservations and to ensure that a user never gets assigned a parking space whose value is more than the existing cost function value, the allocation is made at the next decision point. This method ensures reservations and improved response from the system.

CHAPTER 3: METHODOLOGY

Smart Vehicle Parking System using Arduino UNO Smart stopping is the designing, developing, and implementing a major edge-stopping innovation. Drivers can locate an empty space with the help of this vehicle stopping system. It checks whether a vehicle is present or not using the IR Proximity sensors in every stopping point. It is demonstrated that the Brilliant Parking Framework is a precise, efficient, and cost-effective means to inform street customers of the specific locations of available parking spaces.

1. The following are the elements of the proposed framework:

- Drivers find nearby available parking spaces.
- The mobility clog is minimized when fewer drivers try to stop.
- Avoids dangerous atmospheric deviations and air pollution.
- Strong, sturdy, and scalable.
- Extends the urban range and shortens the driving stretch.
- Provides means to speed up parking spot management and accurately measure car occupancy gradually.

3.2 Disgrace parking:

It is disgraceful parking when a vehicle is parked in such a manner that it occupies two parking slots instead of one. When a driver is negligent with the rights of another driver, parking can happen. The evolution of intelligent parking systems with automation addresses this.

3.3 Circuit Connections:

- Connect the IR sensors VCC and GND pins to the Arduino board's 5V and GND pins, respectively.
- The signal pins of the IR sensors (ir_enter, ir_back, and ir_car1 through ir_car4) must be connected to any Arduino digital input pins that are available (pins 2, 4, 5, 6, 7, 8).
- Connect the servo motor signal wire to pin 3 of the digital output of the Arduino.
- Connect the SDA and SCL pins of the LCD module to the Arduino's corresponding SDA and SCL pins (A4 and A5 in most Arduino boards).
- Connect the LCD module's VCC and GND pins to the Arduino board's 5V and GND pins, respectively.

3.4 Coding using Arduino UNO:

```
#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 = 4; //Total number of parking Slots
int flag1 = 1;
int flag2 = 1;
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();
}
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 4: COMPONENTINTRODUCTION

1. ARDUINO UNO:- The ATmega328P is the basis for the Arduino UNO microcontroller board. It has a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. All you need to power the microcontroller is provided; to begin, simply plug it into a computer using a USB cable or power it with a battery or AC-to-DC adapter. You can try out your UNO without worrying too much about messing it up; worst case, you can always start over by replacing the chip for a few dollars.

Fig 4.1 Arduino

2. SERVO MOTORS - An electric motor that can be controlled to move accurately, typically position, speed, or torque, is referred to as a servo motor. Robotics, automaton, CNC devices, and radio-controlled devices use it extensively. Normally used in closed systems, servo motors are provided with feedback (e.g., position) and correct themselves to realize and maintain a desired output.

Fig 4.2 Servo Motor

2. INFRARED SENSOR- An infrared (IR) sensor is a device used to sense objects or measure distance using infrared radiation (light waves slightly longer than the visible spectrum).Simply, it can check if something is there without touching it.

Fig 4.3 Infrared sensor

5. 16 X 2 I 2 C LED- With a 16x2 LCD, two lines containing 16 characters each can be displayed on the screen. Normally, a microcontroller (e.g., Arduino, ESP32, etc.) interfaces to an LCD (e.g., popular HD44780-based ones) through a huge number of pins (at least 6–10 wires).A small I2C adaptor module, usually a PCF8574 I/O expander, is mounted on the back of an I2C 16x2 LCD.When I2C (Inter-Integrated Circuit) connection is utilized, the LCD only needs two wires for power and data:Data Line (SDA),Clock Line (SCL)Along with VCC and GND

Fig 4.4 16X2 I2C LCD Display

5. JUMPING WIRES- A jumper wire is a short electrical wire used commonly during testing or prototyping to connect elements on a breadboard or among other circuit elements.types :male to male,female to male,female to female.

Fig 4.5 Jumper wires

CHAPTER 5: CIRCUIT DIAGRAM

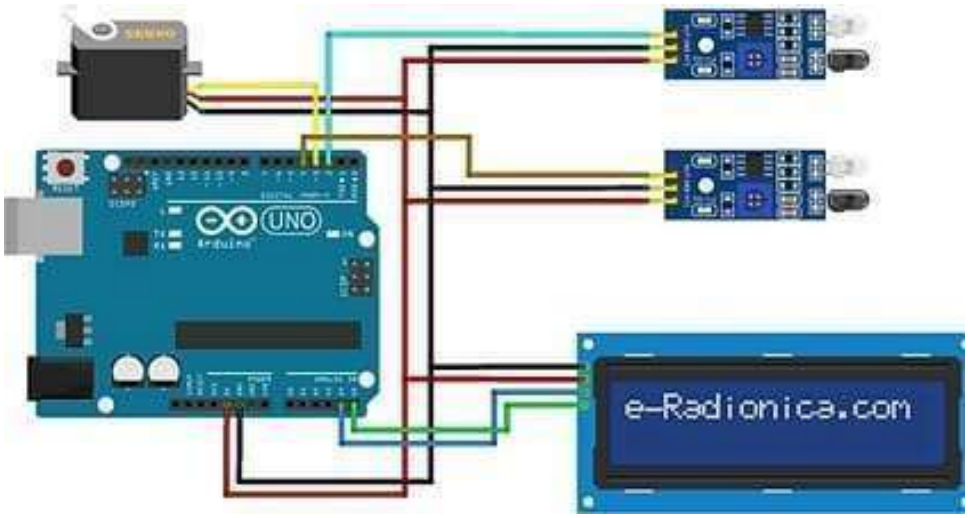

Fig 5.1 Circuit Diagram of Smart Car parking System

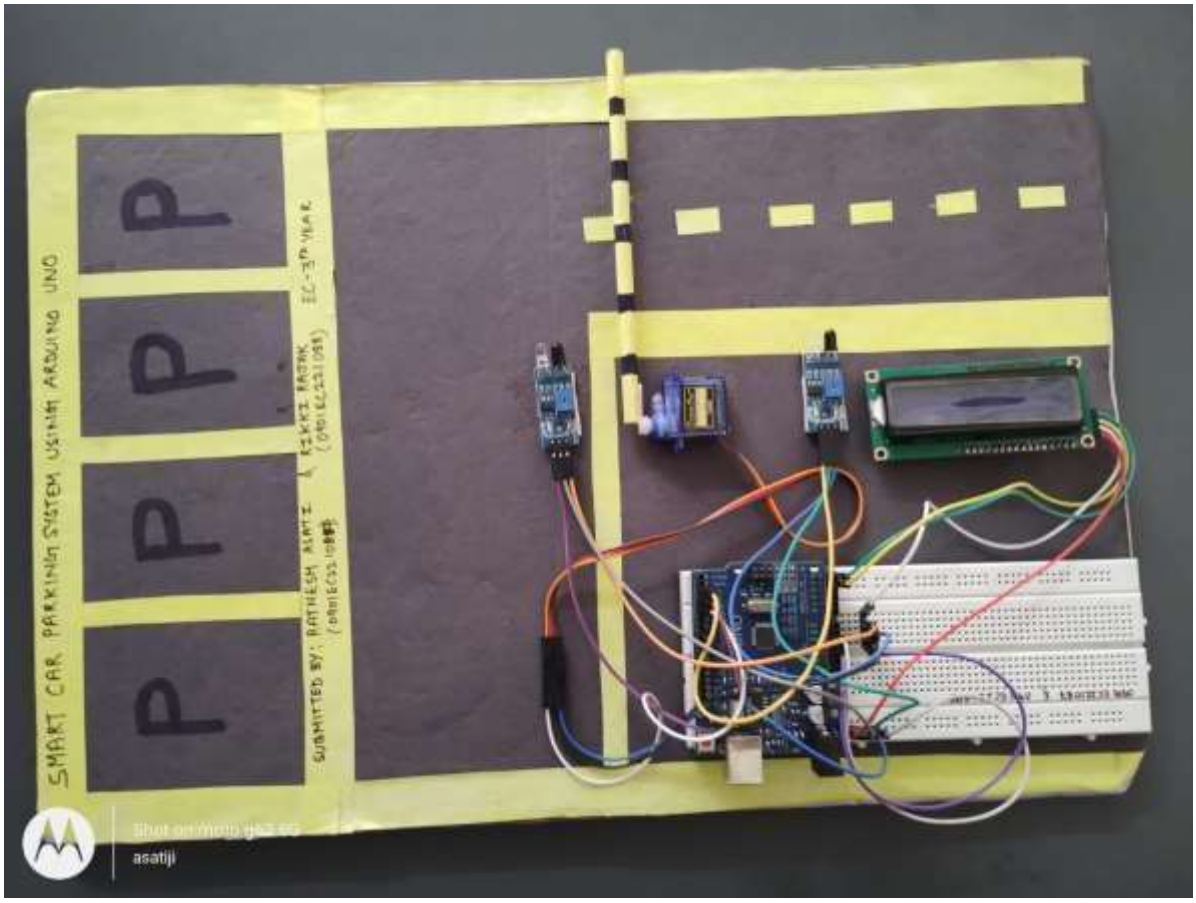

Fig 5.2 Smart Car parking System

CHAPTER 6: WORKING PROJECT

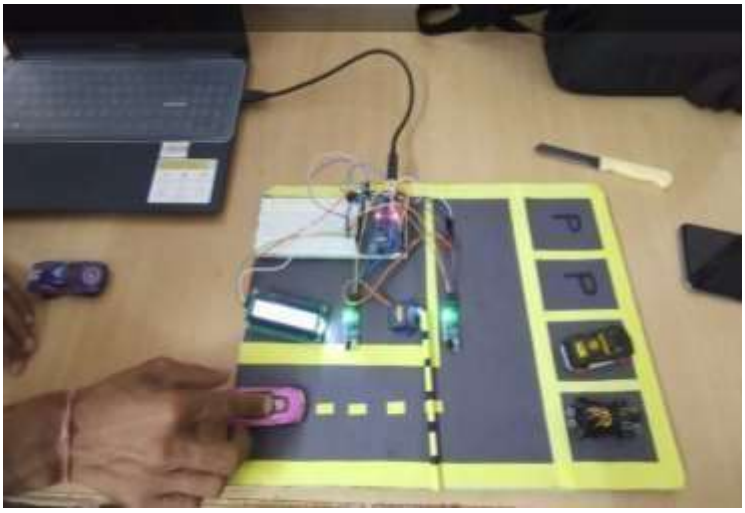

Fig 6.1 Working Model

Fig 6.2 Working Model

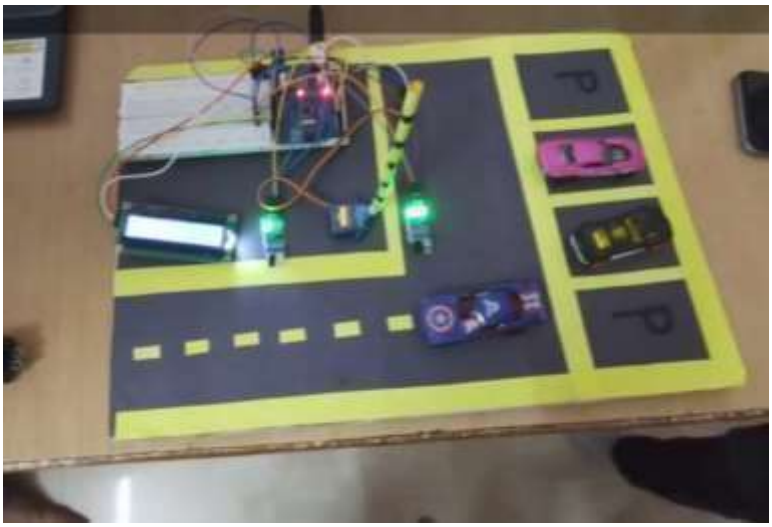

Fig 6.3 Working Model

Fig 6.4 Working Model

CHAPTER 7: WORKING

Employing infrared sensors, a servo motor, and a microcontroller to track, control, and display real-time parking space availability, the Arduino Uno Smart Car Parking System works on the principle of automated vehicle detection and controlled parking space access.

KEY WORKING PRINCIPLE:

1. PARKING SPACE SENSOR:- There is an ultrasonic sensor installed on every parking space. The Infrared proximity sensor keeps track of the car's proximity as it enters a space, and when the car is present (distance < threshold), the sensor triggers the Arduino.
The Arduino switches on an LED (red when occupied, green when available) depending on this information.

CIRCUIT SENSOR:- There is an echo pin and a trigger for each Infrared proximity sensor. The echo pin will receive the pulse that is triggered by the trigger pin. Arduino computes the car's distance from the time elapsed for the return of the pulse.

2. CONTROL OF ENTRY AND EXIT:- Control of entry and exit is maintained by a gate system or servo motor. The sensor identifies whether an available spot exists when a vehicle drives into the parking lot. Based on the data processed, the Arduino releases the gate (controlled by a servo motor or relay) for admission if a slot is vacant.
The machine can be made to ring a buzzer or give a message if it is displayed on an LCD screen to inform users that no more spots are available when the parking lot is full.

3. INFORMATION DISPLAY: LEDs:- These show whether a parking space is available (green) or taken (red). There can be an optional LCD display that indicates the number of parking spaces left and guides the vehicle to one.

4. DETECTION AND INDICATION:- The parking space becomes indicated as vacant when the vehicle departs, as identified by the ultrasonic sensor. The other drivers may then observe the vacant space once the Arduino makes the color of the LED shift from red (occupied) to green (vacant). To offer sound input, the system can also produce a sound using the buzzer if a car is parked or if the parking area is full.

5. PARKING CAPACITY AND MANAGEMENT:- The Arduino can be set to constantly keep track of the number of total vehicles and empty spaces. For distant monitoring, there is an even more advanced variant that can even send parking status notifications to a web dashboard or mobile app.

FLOW CHART

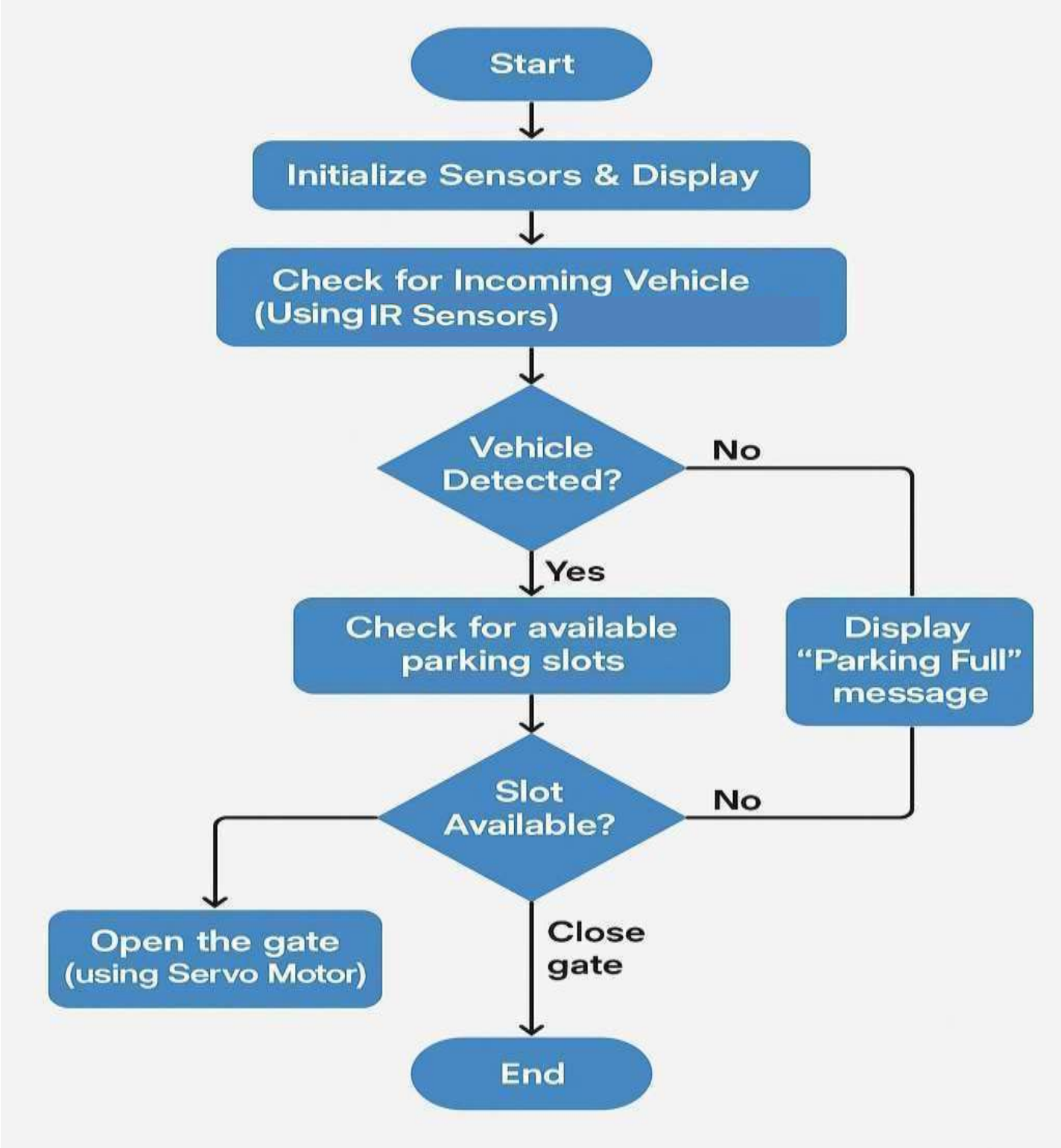

Figure 7.1 Flow Chart Of Smart Car Parking System

CHAPTER 8: CONCLUSION

In a new city, our project assists drivers in parking by identifying vacant spots. This system efficiently reduces the average parking wait time for users. The proposed system provides the optimal solution, with most cars successfully locating an available parking spot. Our preliminary test results show that the performance of the Arduino UNO-based system can effectively address the needs of today's parking challenges, minimizing the time required to find an available space and offering real-time information rendering. Improved performance, lower costs, and a successful large-scale parking system are all offered by this intelligent parking system. When a vehicle enters the parking lot, the driver parks it in the nearest available space. When the slot is taken, the LED light glows, and when it is vacant, the LED light automatically switches off to indicate that the space is available for use by someone. Moreover, it eliminates the necessity for automobiles to navigate through congested car parks in a city.

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5 Arduino IDE Software : https://www.arduino.cc/en/software

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