CONSTRUCTION OF AN AUTOMATIC CAR PARKING SYSTEM

A thesis
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'A thesis report submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Science in Mechanical Engineering of the Sonargaon University (SU)'

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Abstract

The Automatic Car Parking System is a project designed to automate the process of parking vehicles using an Arduino Uno microcontroller, an LCD display, IR sensors, and a servo motor. The system is intended to optimize parking space utilization and streamline vehicle management in parking lots. In this system, IR sensors are used to detect the presence of a car at the entrance of the parking area. Upon detection, the Arduino Uno processes the signal and controls a servo motor, which opens a barrier gate to allow the car to enter. The system simultaneously updates the available parking spots on the LCD display, providing real-time information to users. As the vehicle enters and parks, the system decreases the count of available spots. When a car exits the parking area, the IR sensors detect the departure, and the Arduino Uno increases the available parking count accordingly. The servo motor then closes the gate, ensuring that only one car enters or exits at a time. This automated system not only reduces the need for manual intervention in parking management but also enhances the efficiency and safety of parking operations. It is a scalable solution that can be implemented in various settings, including shopping malls, office buildings, and residential complexes.

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Chapter 1: Introduction

1.1 Preamble

The Automatic Car Parking System is an innovative solution designed to efficiently manage the parking of vehicles using an Arduino Uno microcontroller. The system is equipped with an IR sensor to detect the presence of a car, and a servo motor to control the barrier mechanism. The interface includes an LCD screen with I2C connectivity to display parking status, such as availability or occupancy. Powered by a 3.7V battery, the setup uses a buck converter to regulate the voltage for optimal system performance. The car used in the system is a plastic model, integrated into a setup built on a sturdy sun board structure. Wiring tap and jumper wires are used for electrical connections, and color spray is applied for aesthetic finishing. This project demonstrates a practical approach to automating parking spaces, minimizing manual intervention and enhancing efficiency.

1.2 Problem Statement

The problem addressed by the Automatic Car Parking System is the inefficiency and inconvenience of manually managed parking systems, which often result in congestion, mismanagement of available spaces, and delays in parking and retrieving vehicles. In busy areas, the lack of an automated system leads to improper space utilization and increased human effort. To solve these issues, this project proposes an automatic parking system using an Arduino Uno, IR sensors, and a servo motor to automate vehicle entry and exit. The system detects car presence using an IR sensor and controls a barrier via the servo motor, ensuring efficient space management. The LCD display provides real-time parking status, and the entire setup operates with a 3.7V battery and a buck converter for power regulation. This solution aims to reduce manual intervention, optimize parking space usage, and streamline the process in parking lots, offering a cost-effective and reliable alternative to traditional parking management systems.

1.3 Purpose and Scope

The purpose of the Automatic Car Parking System is to create an efficient, automated solution for managing parking spaces, reducing human effort and errors in the process.

By utilizing an Arduino Uno, IR sensor, servo motor, and an LCD with I2C for display, the system automates the detection of vehicles and controls the entry/exit barriers, making parking management smoother and faster. The project aims to minimize parking congestion and optimize the use of available space, especially in locations where manual management may be inefficient or impractical.The scope of the project covers the development of a small-scale model using a plastic car and sun board to simulate real-world parking scenarios. It includes designing a reliable sensor-based detection system and a motorized gate controlled by the servo motor. The system operates on a 3.7V battery, regulated by a buck converter, to ensure proper functioning of all components. Wiring tap and jumper wires are used for connections, with the color spray enhancing the aesthetics. While the project focuses on a basic model, it has potential for expansion into larger parking facilities, offering a scalable and cost-effective solution for smart parking systems.

1.4 Study Background

The The study background of the Automatic Car Parking System emerges from the increasing need for efficient parking solutions in urban environments where space is limited, and manual parking management often leads to congestion, delays, and human error. Traditional parking systems rely heavily on human intervention, which can be inefficient and prone to mistakes, especially in busy or high-traffic areas. The advent of automation and smart systems offers an opportunity to enhance these processes through technology. This project leverages basic yet powerful components such as the Arduino Uno microcontroller, IR sensor, and servo motor to create an automated parking system that can detect the presence of a vehicle and control a barrier gate accordingly. An LCD with I2C functionality is used to display real-time parking information, providing users with clear and instant updates on space availability. Powered by a 3.7V battery and stabilized by a buck converter, the system is designed to be energy-efficient and portable. The use of a plastic car and sun board in the model setup serves as a scaled-down representation of real-world applications, where such systems could be implemented in parking lots, commercial complexes, and residential areas to streamline parking processes. This project builds on the concepts of automation, sensor integration, and power management, with the goal of creating a practical, cost-effective solution to modern parking challenges.

1.5 Objectives of the Study

The Automatic Car Parking System aims to address the challenges of manual parking management by introducing automation to streamline the process. In congested urban areas, parking inefficiencies lead to wasted time, poor space utilization, and unnecessary human intervention. By using simple and cost-effective components like Arduino Uno, IR sensors, and a servo motor, this system enhances parking management by automating vehicle detection and gate control. This study focuses on developing a reliable and scalable parking solution. To achieve this, the study will focus on several specific objectives, outlined as follows:

- Develop an automated system to detect vehicles and control entry/exit barriers using sensors and a servo motor.[3]
- Provide real-time parking status through an LCD display to ensure clear communication of parking availability.[5]

Chapter 2: Literature Review

The literature review for the Automatic Car Parking System explores previous research and technological advancements related to automated parking systems, sensor-based vehicle detection, and microcontroller-based automation. It examines how various components, such as IR sensors, servo motors, and LCD displays, have been effectively utilized in similar systems to enhance parking efficiency and reduce human intervention. The review also highlights the importance of energy-efficient designs and scalable prototypes in the development of smart parking solutions.

2.1 Historical Development

The historical development of sieving technologies has transitioned from mechanical filtering systems used in industries like food processing and construction to advanced electronic sensor-based systems that manage and filter inputs in real-time. Traditionally, sieving involved the physical separation of materials, but with the advent of modern technology, this concept evolved into the use of sensors and automation to filter, detect, and manage various parameters. In the context of automated parking systems, early systems were largely manual or used basic mechanical gates. However, the introduction of microcontrollers such as the Arduino Uno and sensor technologies like IR sensors has revolutionized these systems. These sensors act as "sieves," detecting vehicles and controlling automated barriers, enabling precise and real-time management of parking spaces. This shift from manual to sensor-based automation has paved the way for smart parking systems, where vehicles are automatically detected, and barriers are controlled with minimal human intervention. The Automatic Car Parking System leverages these advancements, incorporating modern sieving techniques through sensors and microcontroller-based automation to enhance parking efficiency and accuracy.

2.2 Discussion

The Literature Review of the Automatic Car Parking System reveals significant advancements in automation, sensor integration, and microcontroller applications that have shaped modern parking systems. Traditional parking systems often faced challenges such as inefficient space utilization, human error, and time delays,

particularly in busy urban areas. However, with the evolution of automation technologies, sensor-based systems utilizing infrared (IR) and ultrasonic sensors have emerged, offering enhanced detection accuracy and reducing the need for manual intervention. Arduino-based systems, especially those using the Arduino Uno, have gained popularity due to their affordability, ease of programming, and flexibility in integrating various sensors and actuators. Research has demonstrated that IR sensors provide reliable and cost-effective solutions for vehicle detection, accurately identifying the presence of a car and triggering actions like opening or closing gates. The integration of servo motors to control barriers further enhances the automation process, allowing for precise and controlled movements. Additionally, the use of LCD displays with I2C connectivity facilitates real-time feedback to users regarding parking availability, improving user experience and reducing congestion. The literature also emphasizes the importance of power management, with a 3.7V battery and buck converter ensuring energy efficiency—critical for sustainable system design. Overall, the discussion highlights that automated car parking systems have become more efficient, scalable, and user-friendly due to innovations in sensor technology, microcontroller applications, and power optimization, forming the foundation upon which the Automatic Car Parking System project builds, creating a practical and scalable model for real-world parking management.

Chapter 3: Methodology and Construction Procedure

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of Node MCU, LCD Display, Resistor, Transistor, Crystal, LCD display (16x4), Vero board, and other components. Here we can know that the total system overview of the projects. And we will also know that how the equipment are working with each other.

3.1 Theory

We've developed the system that can handle this critical switching situation perfectly.

3.1.1 Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010. The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins, 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.



Fig. 3.1.1: Arduino Uno

3.1.2 Battery

3.7V is the voltage of ternary lithium batteries, not all lithium batteries are the same voltage, lithium iron phosphate is 3.2V. General lithium cobalt oxide, ternary positive electrode with graphite anode can obtain a full charge voltage of about 4.2V, while lithium iron phosphate can only reach 3.6V.



Fig. 3.1.2: Battery

3.1.3 LCD Display

This I2C 20x4 LCD display module is designed for Arduino microcontroller. It is using I2C communication interface, With this I2C interface, only 2 lines (I2C) are required to display the information on any Arduino based projects. It will save at least 4 digital / analog pins on Arduino. All connector are standard XH2.

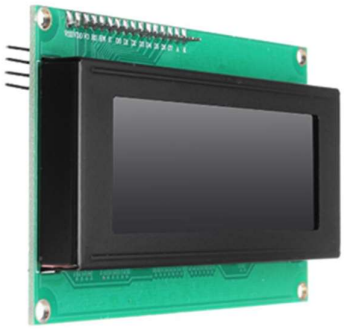


Fig. 3.1.3: LCD Display

3.1.4 IR Sensor

An Infrared light-emitting diode (IR LED) is a special-purpose LED that emits infrared rays ranging from 700 nm to 1 mm wavelength. Different IR LEDs may produce infrared light of differing wavelengths, just like other LEDs produce light of different colors. IR sensor is a device that uses infrared technology to detect objects or changes in the environment. IR sensors can detect a wide range of physical properties such as temperature, motion, and proximity.



Fig. 3.1.4: IR Sensor

3.1.5 Switch

A control is defined as an on-off switch when its function is to open or close an electrical circuit in a stable manner. If the closing or opening occurs in a non-stable or momentary manner, we are talking about a momentary on-off switch or push-button on-off switch, more briefly called on-off push-buttonInfrared.



Fig. 3.1.5: Switch

3.1.6 Buck Converter

The buck converter, also referred to as a step-down converter, is a popular topology in power electronics that converts a higher input voltage to a lower output voltage. It is crucial in various applications, from portable devices to automotive systems, where specific components or subsystems require a lower voltage level to operate. The primary advantage of the buck converter is its simplicity, which enables efficient voltage conversion using a relatively small number of components.



Fig. 3.1.6: Buck Converter

3.1.7 Battery Holder

A battery holder is either a plastic case with the shape of the housing moulded as a compartment or compartments that accepts a battery or batteries, or a separate plastic holder that is mounted with screws, eyelets, glue, double-sided tape, or other means. Battery holders may have a lid to retain and protect the batteries or may be sealed to prevent damage to circuitry and components from battery leakage. Coiled spring wire or flat tabs that press against the battery terminals are the two most common methods of making the electrical connection inside a holder. External connections on battery holders are usually made by contacts with pins, surface mount feet, solder lugs, or wire leads.



Fig. 3.1.7: Battery Holder

3.1.8 SG90 Servo Motor

The SG90 Servo Motor offers precise control and accuracy but has a limited range of motion. It typically provides a rotational movement of around 180 degrees. This means that it can rotate from one end to the other within this range, allowing for a decent range of movement in many applications.



Fig. 3.1.8: SG90 Servo Motor

3.1.9 Plastic Car

Friction powered (no battery needed). Just pull it back and then the vehicle will automatically go. It's easy to play with kids to make an amazing time to interact with toddlers. This Toy have extra grip high quality tire can crawl easily with friction power unbreakable material. Pull Back Car,6 Pcs Mini Truck Toy Kit Set, Toys Play

Construction Engineering Vehicle Educational Preschool for Children Boys Party Favors, Kids Birthday Game Gift Play set Classroom Reward.



Fig. 3.1.9: Arduino Uno

Chapter 4: Working Principle

In this chapter fully cover with discuss design and fabrication of this project. Here we will discuss about developed block diagram and briefly describe about the circuit description and also learn about working principle. Total project flow chart is also available in this chapter.

4.1 Block Diagram

In this Part of disscusion we will descrive about the Block diagram of our system. Here you see that, we use here a Arduino Uno as a microcontroller to control this total system. Here We insert Four numbers of 3.7V Battery that will provide almost 16V DC Voltage and then Buck Converter will be converted to 5V DC voltage. This 5V DC Voltage will helps to run our total system.

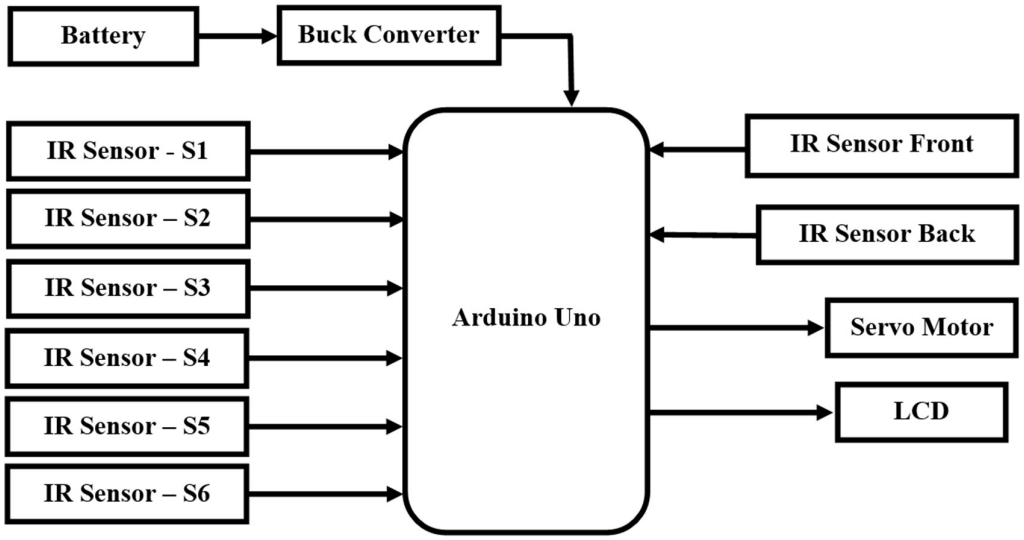


Fig. 4.1: Block diagram of Proposed System

We use here multiple IR sensor for multiple responsibility. IR sensor Front and Back will count the IN and OUT quantity of car in our parking area, also this two IR sensor will control the path of vehicle movement by sending command for Servo motor that will control Entry path. Extra 6 number of IR sensor will read the presence or absense value from each parking slot. LCD is used here to show all the operation output for manually monitoring. Here One servo motor is used here to control the enter and out of vehicles.

4.2 Circuit Diagram

In this Part of disscusion we will descrive about the Circuit diagram of our system. Here you see that, we use here a Arduino Uno as a microcontroller to control this total system. Here We insert Four 3.7V Battery that will provide almost 16V DC Voltage and then Buck Converter will be converted to 5V DC voltage. This 5V DC Voltage will helps to run our total system.

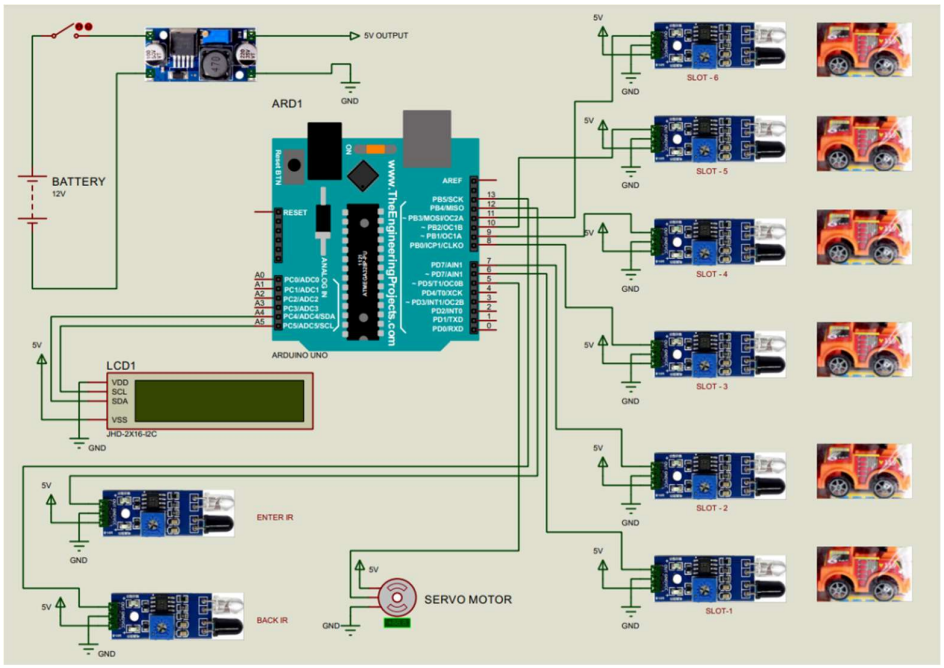


Fig. 4.2: Block diagram of Proposed System

We use here multiple IR sensor for multiple responsibility. IR sensor Front and Back will count the IN and OUT quantity of car in our parking area, also this two IR sensor will control the path of vehicle movement by sending command for Servo motor that will control Entry path. Extra 6 number of IR sensor will read the presence or absense value from each parking slot. LCD is used here to show all the operation output for manually monitoring. Here One servo motor is used here to control the enter and out of vehicles.

4.3 Overview

This is the full over view of our project. Here you see that, we use here a Arduino Uno as a microcontroller to control this total system. Here We insert Four 3.7V Battery that will provide almost 16V DC Voltage and then Buck Converter will be converted to 5V DC voltage. This 5V DC Voltage will helps to run our total system.

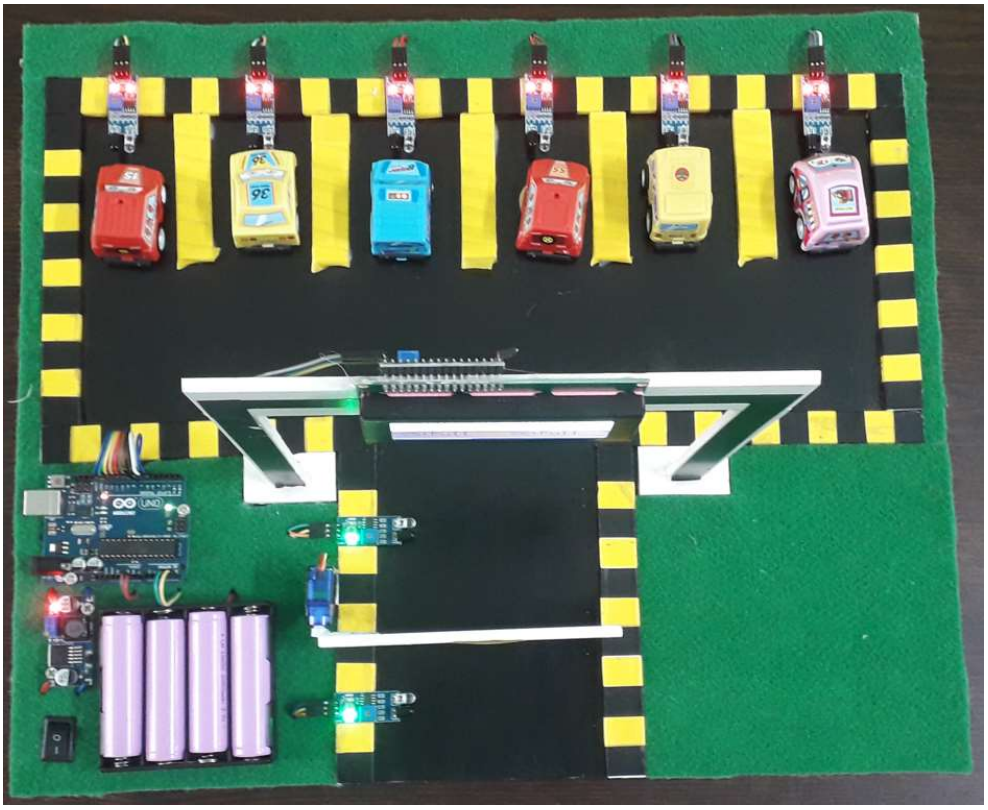


Fig. 4.3: Overview of Proposed System

We use here multiple IR sensor for multiple responsibility. IR sensor Front and Back will count the IN and OUT quantity of car in our parking area, also this two IR sensor will control the path of vehicle movement by sending command for Servo motor that will control Entry path. Extra 6 number of IR sensor will read the presence or absense value from each parking slot. LCD is used here to show all the operation output for manually monitoring. Here One servo motor is used here to control the enter and out of vehicles.

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4.5 Flow Chart

This is the Flue chart of our project.

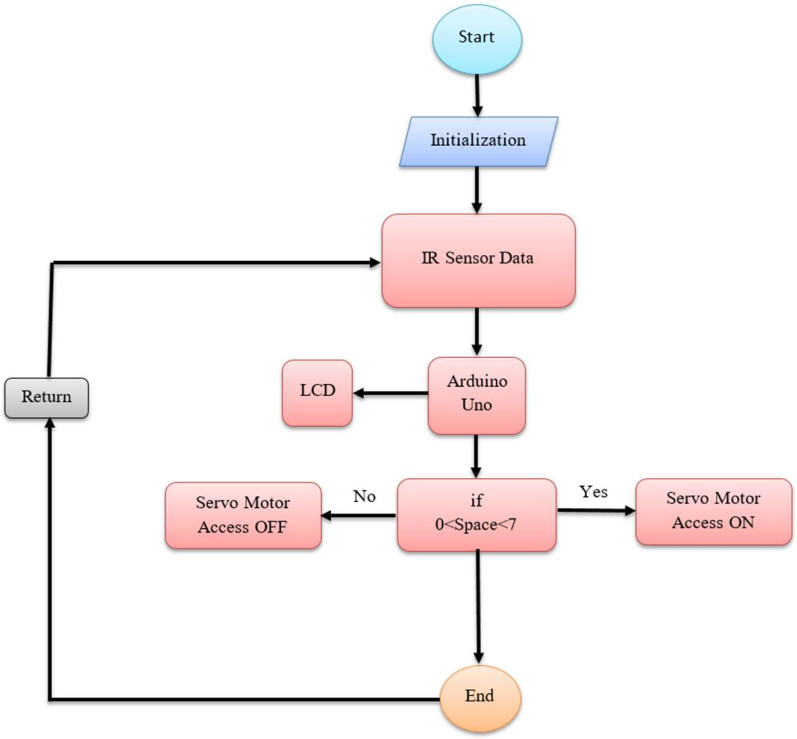


Fig. 4.4: Flow chart of Proposed System

4.6 Conclusion

In this chapter we have discussed the block diagram, circuit description, working principle, flow chart also show the real image of the project and others. In the later part of this paper we discussed the result & discussion of the project to make the concept clear to anyone.

Chapter 5: Results and Discussions

5.1 Results

Here we will try to show the results of our project in bellow. we design here total 6 number of slot to car parking. we use here one IR sensor to detect the presence of car in every sing slot. Extra Two IR sensor is used here to count the enter and exit car quantity. This two IR sensor also Control the gate using servo motor



Fig. 5.1: Available Slot 6



Fig. 5.2: Available Slot 5



Fig. 5.3: Available Slot 4



Fig. 5.4: Available Slot 3

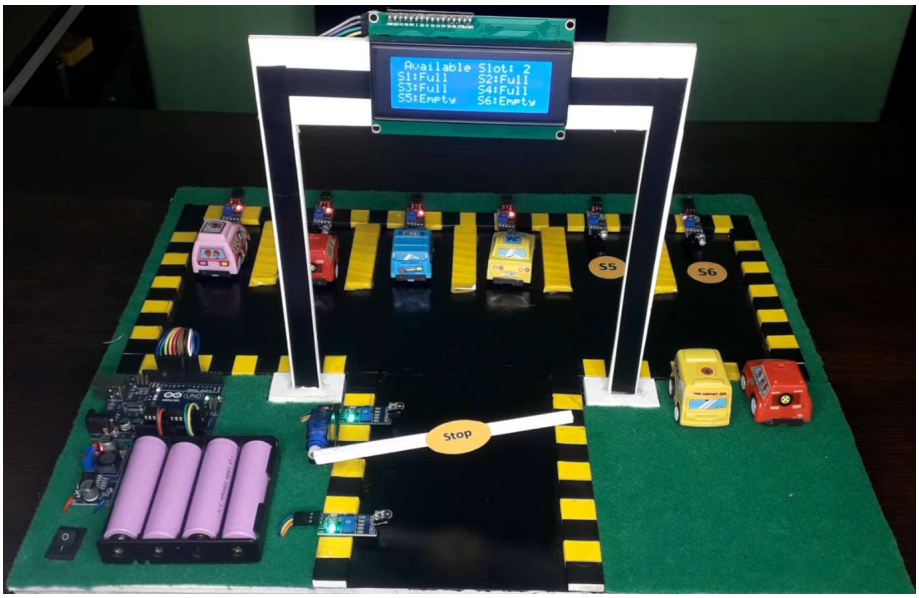


Fig. 5.5: Available Slot 2



Fig. 5.6: Available Slot 1

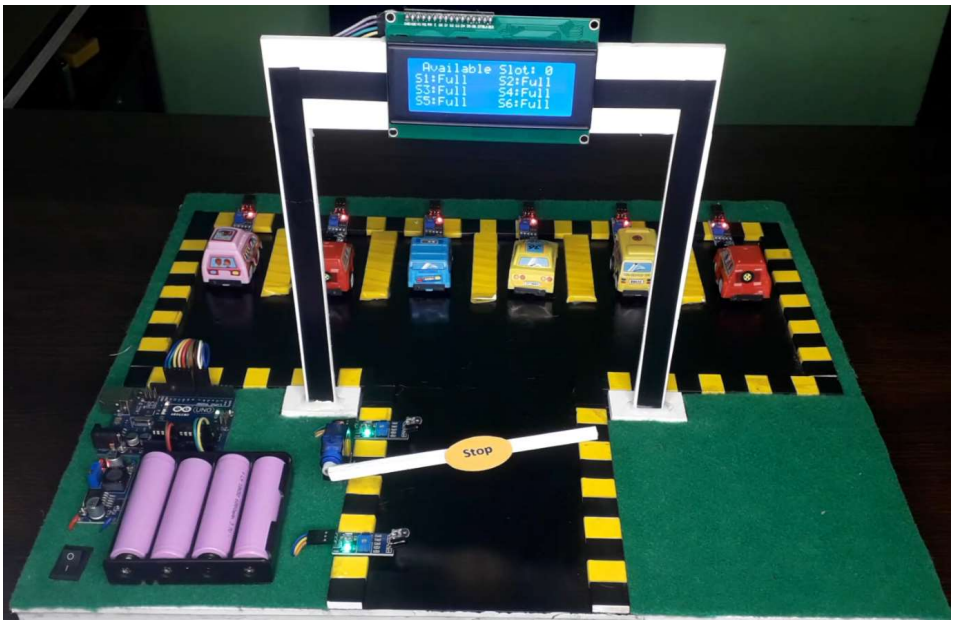


Fig. 5.7: Available Slot 0

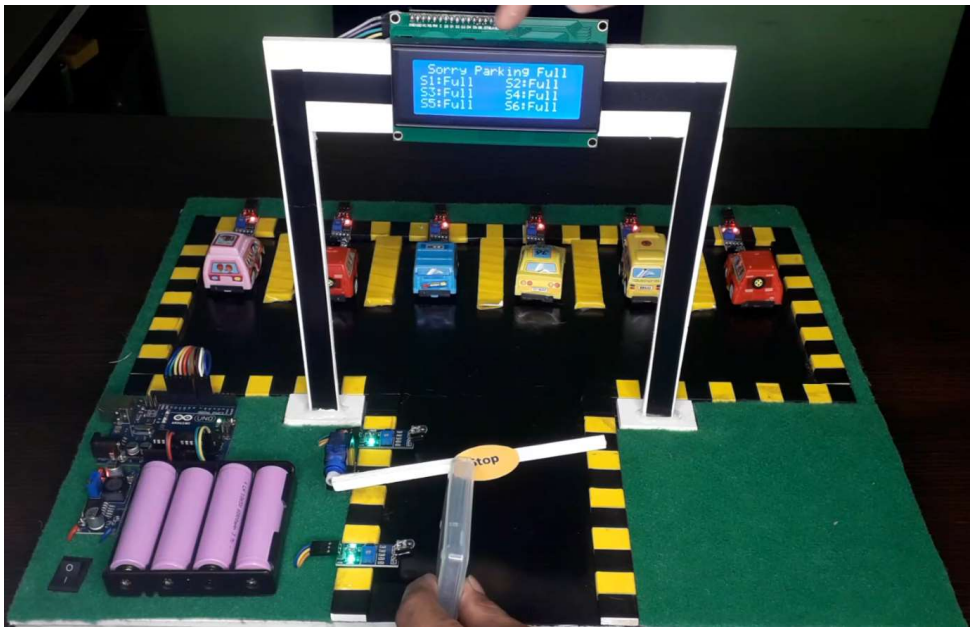


Fig. 5.8: No Entry Permitted Cause Parking is Full Now.

5.2 Advantage

Arduino and IR sensor-based automatic car parking systems offer a range of advantages, particularly in terms of cost, flexibility, and ease of implementation. Here are the key benefits:

- Affordable Components: Arduino boards and IR sensors are relatively inexpensive compared to commercial parking automation systems, making them accessible for small businesses, educational institutions, and residential applications.
- Low Development Costs: Open-source nature and availability of extensive community support reduce development costs significantly.
- Minimal Maintenance: Simple design and fewer mechanical parts lead to lower maintenance costs over time.
- Easy Customization: Arduino platforms are highly customizable, allowing developers to tailor the system to specific requirements, whether for different vehicle sizes or unique environmental conditions.
- Modular Design: The system can be easily expanded or modified by adding more sensors or integrating additional functionalities like wireless communication or user interfaces.
- Simple Integration: Integration of IR sensors with Arduino is straightforward, with numerous libraries and resources available to simplify the development process.
- User-Friendly Programming: Arduino's programming environment is designed to be accessible even for beginners, allowing for quick prototyping and deployment.
- Quick Installation: Systems can be quickly installed and operational, requiring minimal infrastructure changes or disruptions.
- Instant Feedback: Provides real-time information on parking availability, improving user experience and reducing waiting times.
- Data Analytics: Enables data collection on parking usage patterns, which can be analyzed to optimize space allocation and improve operational efficiency.

These advantages make Arduino and IR sensor-based automatic car parking systems an appealing choice for a wide range of applications, from small-scale personal projects to larger commercial and public implementations.

5.3 Disadvantages

While Arduino and IR sensor-based automatic car parking systems offer numerous benefits, they also come with certain limitations and challenges. Here are some of the key disadvantages:

- Component Quality: The reliability of the system is heavily dependent on the quality of the components used. Low-cost sensors and Arduino boards might not be as durable or reliable as those in commercial-grade systems.
- Maintenance Requirements: Frequent calibration and maintenance may be necessary to ensure consistent performance, especially in harsh or variable environments.
- Susceptibility to Interference: IR sensors can be susceptible to interference from sunlight, reflective surfaces, or other IR sources, which can lead to false readings or reduced accuracy.
- Signal Blockage: Objects or vehicles in close proximity might block the IR signal, causing detection issues in crowded or confined spaces.
- Arduino Limitations: Arduino microcontrollers have limited processing power and memory, which can restrict the complexity of the algorithms that can be implemented for advanced data processing, decision-making, or integration with other systems.
- Performance Bottlenecks: Handling multiple sensors and real-time data processing simultaneously can strain the Arduino's capabilities, potentially leading to delays or reduced performance.

These disadvantages highlight areas where Arduino and IR sensor-based parking systems may fall short, particularly in more demanding or complex applications.

Understanding these limitations is crucial for determining their suitability and for planning potential enhancements or choosing alternative solutions.

5.4 Discussion

At the end of the project, the prototype has been completed, designed and implemented, as shown in Fig. 3(a) and (b). Therefore, this Smart Car Parking System, with a small size, was able to perform four maximum spaces for the car to enter, pass through the bar, and arrive at a vacant spot; we can see that the empty spot has an IR sensor, which will switch on the light. When the automobile exits, the Infrared sensor and the LED will switch off automatically. In addition, the barrier will not open when the 6th car arrives, and the LCD will display "No available places.". The process of this system is not complicated, and it is a user-friendly system. When a car goes into the parking lot, the IR sensor at the gate will sense it. The IR sensor will transmit the data into Arduino UNO. Arduino UNO will process the data from the IR sensor at the gate, and it will decide whether to open the gate bar. If there is space in the car park, the Arduino UNO will send a signal/ message to the servo motor to open the gate so the car can go through. When the car passes through the servo motor, the IR sensor at the gate will sense the car and transmit the data into Arduino UNO. The Arduino UNO will instruct the servo motor to close the gate bar. When a car goes into the parking lot, Arduino UNO will send a signal to LCD to display the number of car parks has decreased. When the car is parked in the parking space, the IR sensor at the parking space will sense the car. The IR sensor will transmit the data into Arduino UNO. Arduino UNO will instruct the LED to turn off and vice versa. The LED will be on when there is no car in the parking space. When a car leaves the parking lot, the IR sensor will sense the car and send a message to Arduino UNO. Arduino UNO will instruct the servo motor to open the gate bar after it processes the data that send by the IR sensor. When the IR sensor senses the car, it sends a signal/message to Arduino UNO. Arduino UNO will instruct servo motors to close the gate bar. When a car goes out of the parking lot, Arduino UNO will send a message to LCD to print that the number of the car park has increased and vice versa. If the parking lot is full, the process is almost the same, but there are some differences. After the first IR sensor senses the car, the IR sensor will send a signal/message to

Arduino UNO. After that, Arduino UNO will send a message to the LCD to print, "sorry, no space".

5.5 Cost Estimation

Table:5.1: Cost Estimation

SI	Particulars	Qty.	Unit Price	Total Price
1	Arduino Uno	1	450	750
2	LCD + I2C	1	450	450
3	IR Sensor	8	60	480
4	3.7V Battery	4	90	360
5	Battery Holder	1	80	80
6	Servo Motor	1	210	210
7	Buck Converter	1	90	90
8	Switch	1	10	10
9	Plastic Car	6	40	240
10	Sun Board	1	400	400
11	Wiring Tap	3	20	60
12	Color Spry	1	160	160
13	Jumper Wire	2 set	80	160
14	Others	Needed	500	500
			Total=	**3950/-**

5.6 Applications

An Arduino and IR sensor-based automatic car parking system can find applications in various settings due to its flexibility, cost-effectiveness, and ease of customization. Here are some practical applications:

- Automated Home Garages: Enable homeowners to automatically park their vehicles in tight garage spaces without manual maneuvering.
- Shared Parking Management: Manage and optimize the use of limited parking spaces in residential communities, ensuring fair and efficient allocation.
- Office Parking Lots: Automate parking in office complexes to streamline parking processes and reduce the time employees spend searching for spots.
- Shopping Centers and Malls: Provide automated parking solutions to enhance customer convenience and maximize parking space utilization in crowded commercial areas.
- Municipal Parking Garages: Implement in city-operated parking garages to improve space management and provide better service to the public.
- Park-and-Ride Facilities: Use in park-and-ride lots to facilitate efficient parking for commuters using public transportation systems.
- Stadiums and Arenas: Manage large volumes of vehicles efficiently during events to reduce congestion and improve attendee experiences.
- Convention Centers: Offer automated parking solutions for large-scale events, optimizing space usage and minimizing the hassle for visitors.

These applications demonstrate the versatility and utility of an Arduino and IR sensor-based automatic car parking system across various sectors and settings, each benefiting from improved efficiency, safety, and user convenience.

Chapter 6: Conclusion

The Automatic Car Parking System using Arduino Uno, LCD Display, IR Sensor, and Servo Motor represents a significant step forward in modernizing and automating parking management. By leveraging simple yet effective components, the system offers a reliable, efficient, and user-friendly solution that addresses common challenges associated with traditional parking methods. Through the integration of IR sensors, the system is capable of accurately detecting vehicle presence, while the Arduino Uno processes this data to control the servo motor, managing the opening and closing of the barrier gate. The LCD display provides real-time updates on parking availability, making it easier for users to find open spots, thus reducing the time spent searching for parking. The system's automated approach not only enhances convenience for users but also optimizes the utilization of parking spaces, minimizes human error, and improves overall safety within the parking facility. Its scalability and adaptability make it suitable for a wide range of applications, from small residential complexes to large commercial parking lots. In conclusion, the Automatic Car Parking System is a cost-effective and environmentally friendly solution that addresses the growing demand for efficient parking management in urban areas. By reducing manual intervention and streamlining the parking process, this system contributes to a smoother, more organized, and sustainable parking experience.

Future scope

Developing an Arduino and IR sensor-based automatic car parking system can be both a practical and educational project. There are numerous avenues for future work to enhance such a system, whether in terms of functionality, scalability, or integration with advanced technologies. Here are some suggestions for future work:

- Multiple Sensors Integration: Incorporate additional IR sensors or other types of sensors (ultrasonic, LIDAR) to improve the accuracy and reliability of vehicle detection.

- Sensor Calibration and Adjustment: Develop algorithms for dynamic calibration and adjustment of sensors to handle different environmental conditions (lighting, temperature changes).
- Obstacle Detection and Avoidance: Implement sensors that can detect obstacles (e.g., pedestrians or other objects) and adjust the parking process to avoid them.
- Wireless Communication: Introduce wireless communication modules (e.g., Bluetooth, Wi-Fi) to allow remote monitoring and control of the parking system via mobile apps or web interfaces.
- Real-Time Data Transmission: Use wireless communication to transmit real-time data about parking availability to centralized systems or user devices.
- Inter-System Communication: Enable communication between multiple parking units to manage space allocation dynamically and improve overall system efficiency.

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APPENDIX

Programing Code:

```
#include <Servo.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);

Servo myservo;

#define ir_enter 13
#define ir_back 12

#define ir_car1 11
#define ir_car2 10
#define ir_car3 9
#define ir_car4 8
#define ir_car5 7
#define ir_car6 6

int S1 = 0, S2 = 0, S3 = 0, S4 = 0, S5 = 0, S6 = 0;
int flag1 = 0, flag2 = 0;
int slot = 6;

void setup() {
```

```
Serial.begin(9600);

pinMode(ir_car1, INPUT);
pinMode(ir_car2, INPUT);
pinMode(ir_car3, INPUT);
pinMode(ir_car4, INPUT);
pinMode(ir_car5, INPUT);
pinMode(ir_car6, INPUT);

pinMode(ir_enter, INPUT);
pinMode(ir_back, INPUT);

myservo.attach(5);
myservo.write(90);

lcd.init();
lcd.backlight();

lcd.setCursor(0, 0);
lcd.print("  Presented By:  ");
lcd.setCursor(0, 1);
lcd.print("Antor Barua ");
lcd.setCursor(0, 2);
lcd.print("MD Eamin Hossain");
```

```
delay(5000);
lcd.clear();



lcd.setCursor(0, 1);
lcd.print("Ahsan Uddin");
lcd.setCursor(0, 2);
lcd.print("Md Ismail Hossan");
lcd.setCursor(0, 3);
lcd.print("Tanjiba Nusrat jahan");
delay(5000);
lcd.clear();



lcd.setCursor(0, 0);
lcd.print("  Supervised By:  ");
lcd.setCursor(0, 1);
lcd.print("Md. Mahfujul Islam");
lcd.setCursor(0, 2);
lcd.print("Lecturer");
  lcd.setCursor(0, 3);
lcd.print("Depertment of M.E");
delay(5000);
lcd.clear();
```

```
  lcd.setCursor(0, 0);
  lcd.print("  Today's Project  ");
  lcd.setCursor(0, 2);
  lcd.print("    AUTOMATIC CAR  ");
  lcd.setCursor(0, 3);
  lcd.print("   PARKING SYSTEM   ");
  delay(5000);
  lcd.clear();

  Read_Sensor();

  int total = S1 + S2 + S3 + S4 + S5 + S6;
  slot = slot - total;
}

void loop() {

  Read_Sensor();

  lcd.setCursor(0, 0);
  lcd.print(" Available Slot: ");
  lcd.print(slot);
  lcd.print("    ");

  lcd.setCursor(0, 1);
  if (S1 == 1) {
```

```
  lcd.print("S1:Full ");
} else {
  lcd.print("S1:Empty");
}

lcd.setCursor(11, 1);
if (S2 == 1) {
  lcd.print("S2:Full ");
} else {
  lcd.print("S2:Empty");
}

lcd.setCursor(0, 2);
if (S3 == 1) {
  lcd.print("S3:Full ");
} else {
  lcd.print("S3:Empty");
}

lcd.setCursor(11, 2);
if (S4 == 1) {
  lcd.print("S4:Full ");
} else {
  lcd.print("S4:Empty");
}

lcd.setCursor(0, 3);
```

```
if (S5 == 1) {
  lcd.print("S5:Full ");
} else {
  lcd.print("S5:Empty");
}

lcd.setCursor(11, 3);
if (S6 == 1) {
  lcd.print("S6:Full ");
} else {
  lcd.print("S6:Empty");
}


if (digitalRead(ir_enter) == 0 && flag1 == 0) {
  if (slot > 0) {
    flag1 = 1;
    if (flag2 == 0) {
      myservo.write(180);
      slot = slot - 1;
    }
  } else {
    lcd.setCursor(0, 0);
    lcd.print(" Sorry Parking Full ");
    delay(1500);
  }
}
```

```
  if (digitalRead(ir_back) == 0 && flag2 == 0) {
    flag2 = 1;
    if (flag1 == 0) {
      myservo.write(180);
      slot = slot + 1;
    }
  }

  if (flag1 == 1 && flag2 == 1) {
    delay(1000);

    myservo.write(90);
    flag1 = 0, flag2 = 0;
  }

  delay(1);
}

void Read_Sensor() {
  S1 = 0, S2 = 0, S3 = 0, S4 = 0, S5 = 0, S6 = 0;

  if (digitalRead(ir_car1) == 0) {
    S1 = 1;
  }
  if (digitalRead(ir_car2) == 0) {
    S2 = 1;
```

```
  }
  if (digitalRead(ir_car3) == 0) {
    S3 = 1;
  }
  if (digitalRead(ir_car4) == 0) {
    S4 = 1;
  }
    if (digitalRead(ir_car5) == 0) {
    S5 = 1;
  }
  if (digitalRead(ir_car6) == 0) {
    S6 = 1;
  }
}
```