M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

on

SMART VEHICLE PARKING SYSTEM

Submitted by

ABINAYA DEVI . N (927622BEE001)
AYYAPPAN . A (927622BEE010)
HARIHARAN . S (927622BEE037)
JANARATHINABABU. A (927622BEE304)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M. KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113.

MAY 2024

M.KUMARASAMY COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this Report titled **"SMART VEHICLE PARKING SYSTEM"** is the bonafide work of **ABINAYA DEVI.N (927622BEE001), AYYAPPAN.A (927622BEE010), HARIHARAN.S (927622BEE037), JANARATHINABABU.A (927622BEE304)** who carried out the work during the academic year (2023-2024) under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report.

SIGNATURE
SUPERVISOR
Mr.P.Maniraj M.E.,
Assistant Professor
Department of Electrical and
Electronics Engineering
M.Kumarasamy College
of Engineering, Karur

SIGNATURE
HEAD OF THE DEPARTMENT
Dr.J.Uma M.E., Ph.D.,
Professor & Head
Department of Electrical and
Electronics Engineering
M.Kumarasamy College of
Engineering, Karur

Submitted for Minor Project II (18EEP202L) viva-voce Examination held at M. Kumarasamy College of Engineering, Karur-639113 on ……..

DECLARATION

We affirm that the Minor Project II report titled "**SMART VEHICLE PARKING SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

REG NO.	STUDENT NAME	SIGNATURE
927622BEE001	**ABINAYA DEVI.N**	----------
927622BEE010	**AYYAPPAN.A**	----------
927622BEE037	**HARIHARAN.S**	----------
927622BEE304	**JANARATHINABABU.A**	----------

VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:

Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a memberor leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge andunderstanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.
- **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.
- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

Abstract (Key Words)	**Mapping of POs and PSOs**
Vehicle, Smart parking system, IR sensors, LED Lights, LCD Display	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

ACKNOWLEDGEMENT

Our sincere thanks to **Thiru. M. Kumarasamy, Founder and Dr.K. Ramakrishnan B.E, Chairman** of **M.Kumarasamy College of Engineering** for providing extra ordinary infrastructure, which helped us to complete the Minor project in time.

It is a great privilege for us to express our gratitude to our esteemed **Principal Dr.B.S.Murugan M.Tech., Ph.D.,** for providing us right ambiance for carrying out the project work.

We would like to thank our **Head of the Department Dr.J.Uma M.E., Ph.D., Department of Electrical and Electronics Engineering,** for her unwavering moral support throughout the evolution of the project.

We would like to express my deep gratitude to our Minor Project Guide**Mr.P.Maniraj M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

We offer our wholehearted thanks to our Minor project coordinator **Mr.P.Maniraj M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation and valuable suggestions for making our project a success.

We are glad to thank all the **Faculty Members** of **Department of Electrical and Electronics Engineering** for extending a warm helping hand and valuable suggestions throughout the project.

Words are boundless to thank **Our Parents and Friends** for their constant encouragement to complete this Minor project successfully.

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ABSTRACT

With the increase in vehicle production and world population, more and more parking spaces and facilities are required. In this project a new parking system called Smart Parking System (SPS) is proposed to assist drivers to find vacant spaces in a car park in a shorter time. The new system uses IR sensors to detect either car park occupancy or improper parking actions. Different detection technologies are reviewed and compared to determine the best technology for developing SPS. Features of SPS include vacant parking space detection, detection of improper parking, display of available parking spaces, and directional indicators toward vacant parking spaces, payment facilities and different types of parking spaces (vacant, occupied, reserved and handicapped) through the use of specific LEDs. This project also describes the use of an SPS system from the entrance into a parking lot until the finding of a vacant parking space. The system architecture defines the essential design features such as location of sensors, required number of sensors and LEDs for each level, and indoor and outdoor display boards.

SURVEY FORM

Department of Electrical and Electronics Engineering

18EEP202L – Minor Project II

Problem Identification – Survey Form

1. **Name and Address of the community**:

2. **Age Group**

   a) Less than 10 Years

   b) 10 years to 20 Years

   c) 21 years to 35 Years

   d) 36 Years to 50 Years

   e) More than 50 Years

3. **Discussion:**

   a) What? (Define the Problem)

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   d) Where? (Place of the problem's first occurrence or sighting)

   e) Who? (The person or thing that the problem affects)

f) How? (The sequence of events that resulted in the problem)

Signature of the respondent

g) Which? (People have attempted to solve the issue)

h) Does the problem appear to have only one possible solution?

4) Work Plan of the project

5) Final Solution

Signature of the surveyor

CHAPTER 1

SURVEY FORM ANALYSIS

NAME AND ADDRESS OF THE COMMUNITY:

Name: Ms. S Priya

Address: Elango Nagar, Karur.

Name: Mr. V Gopal

Address: 1/85 North Street, Karur.

Name: Mr. S Siva

Address: 1/88 Kovil Street, Velayuthampalayam

Name: Mr. V Sakthivel

Address: Thirukkampuliyur, Sithalavai

Name: Mr. K Sankar

Address: Thirukkampuliyur, Sithalavai

PROBLEM IDENTIFICATION:

Finding a parking space in most metropolitan areas especially during the rush hours is difficult for drivers. Difficulty arises from not knowing where the available spaces may be at that time traffic congestion may occur .Also identifying and addressing challenges in vehicle parking involves tackling various issues. One primary concern is the lack of real-time space availability monitoring, leading to congestion and inefficiencies. Additionally, traffic flow management poses difficulties, with a need for a systematic approach to guide vehicles efficiently. Problems in security measures further contribute to a suboptimal parking experience. Accessibility issues for individuals with disabilities, environmental impact considerations, and subpar user experiences due to inadequate signage also need attention. Regulatory compliance, maintenance issues, and effective data managementfor strategic improvements round out the multifaceted challenges in the realm of vehicle parking. Addressing these aspects comprehensively is crucial for optimizing parking systems and enhancing user satisfaction.

CHAPTER 2

LITERATURE REVIEW

Paper 1:

Title: Smart Parking System

Author: Anusha, Anushri, Arshitha M S, Geetanjali Bishtannavar.

Year: 2019

Inference:

The project entitled "THE SMART PARKING SYSTEM" presents an IOT based smart parking system which provides an optimal solution for the parking problem in metropolitan cities. Due to rapid increase in vehicle density especially during the peakhours of the day it is difficult task for the users to find the parking space to park their vehicles. This study proposes a smart parking system based on Arduino components and mobile application. The proposed smart parking system consists of an onsite deployment of an slot module that is used to monitor and signalize the state of availability of each single parking space. A mobile application is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly. Smart parking can increase the economy by reducing fuel consumption and pollution in urban cities.

Paper 2

Title: Smart Vehicle Parking System Using IOT

Author: Lingaswamy Vuyyala, Kalyan Kumar Reddy Geereddy

Year:2021

Inference:

Car parking is a major issue in many malls and cities. Efficient and smart way to automate the management of the parking system that allocates an efficient parking space using internet of things technology. To avoid that problem, we developed a project on smart parking system User

can find the slot availability, we use IR sensor to find the parking slot on the vacancy position. The project aims at designing an advanced smart parking system. In this system we use IR obstacle sensors as vehicle presence detection and these sensors are connected to Arduino Microcontroller. All 3IR sensors detect the 3 parking positions corresponding data will be post on LCD. Entry IR Sensor used to control dc motor to access the vehicle into parking area for security purpose. Microcontroller sends the status of all IR sensors to LCD modules to display the available slots as well as telnet IOT server. Microcontroller reads the data display over LCD this will reduce waiting time at parking area and by this system we can effectively use parking zone smartly. This proposed system implemented using embedded 'C' programming language.

Paper 3

Title: Smart-parking management algorithms in smart city

Author: Mahdi Jemmali, Loai Kayed B. Melhim, Mafawez T. Alharbi, Abdullah Bajahzar & Mohamed Nazih Omri .

Year:2022

Inference:

Recently, various advanced technologies have been employed to build smart cities. Smart cities aim at improving the quality of life through the delivery of better services. One of the current services that are essential for any smart city, is the availability of enough parking spaces to ensure smooth and easy traffic flow. This research proposesa new framework for solving the problem of parking lot allocation, which emphasizes the equitable allocation of people based on the overall count of people in each parking space. The allocation process is performed while considering the available parking lots in each parking space. To accomplish the desired goal, this research will develop a set of seven algorithms to reduce the gap in the number of people between parking spaces. Many experiments carried out on 2430 different cases to cover several aspects

such as the execution time and the gap calculations, were used to explore the performance of the developed algorithm. Analyzing the obtained results indicates a good performance behavior of the developed algorithms. Also, it shows that the developed algorithms can solve the studied problem in terms of gap and time calculations. The MR algorithm gained excellent performance results compared to one of the best algorithms in the literature. The MR algorithm has a percentage of 96.1 %, an average gap of 0.02, anda good execution time of 0.007 s.

Paper 4

Title: Smart City Parking System

Author: Ahteshamul huq osmani, Ashwini Gawade, Minal Nikam, Swati Wavare

Year:2016

Inference:

Parking in the city has been a major problem these days. An efficient way to manage the parking system is using Internet of Things (IOT). Traditional parking system commonly uses security ultrasonic sensors, camera or infrared ray sensors to manage the parking areas. However, these systems are not only expensive but time consuming. So it is necessary to have a smart parking system. So, in this system we are using RFIDtag to each of the car and also assigning a sensor to each parking slot. Using an androidapplication user may able to see the available parking slot so that it will require less time than previous system. Also, we will provide information to the user about nearestplaces that is hospitals, hotels, school etc. So, to implement this idea we are using sensors and RFID — Smart city parking, sensors, RFID, Internet of Things (IOT)

Paper 5

Title: Smart Vehicle Parking system using RFID

Author: Adithya V Kumar, Merin Mani, Nafeesathul Nasriya K1 , Rohith C1.

Year:2022

Inference:

The increasing number of vehicles on road has led to the emergence of a major problem in cities in the form of lack of adequate parking space. Parking is also a major challenge in crowded areas like shopping malls, hospitals, and institutes. Hence this work aims to present an automatic real-time system for automated vehicle parking. This system has been implemented with the help of the internet of things (IoTs) which exchanges information or data between the physical devices. The proposed system has been implemented with the help of ESP32 Node MCU to connect parking area with web or internet. The proposed system incorporated an infrared sensor in each slot for getting information about the vacancy position of the parking slot and an amount will be displayed based on the time taken by vehicle. Every user has a registered RFID tag which helps to manage parking space and a smart car parking app to find parking slotsin less time.

CHAPTER 3

PROPOSED METHODOLOGY

BLOCK DIAGRAM

A smart vehicle parking system's block diagram typically includes components like sensors (such as ultrasonic or infrared), a microcontroller or processor, a communication module (like Wi-Fi or Bluetooth), a database or storage system, and a user interface (could be a mobile app or display). Sensors detect available parking spaces, sending data to the microcontroller. The microcontroller processes this information, relaying it to the database for storage and analysis. The communication module facilitates interaction with users, conveying parking space availability through the user interface. Users can then access this information to find and reserve parking spots efficiently.

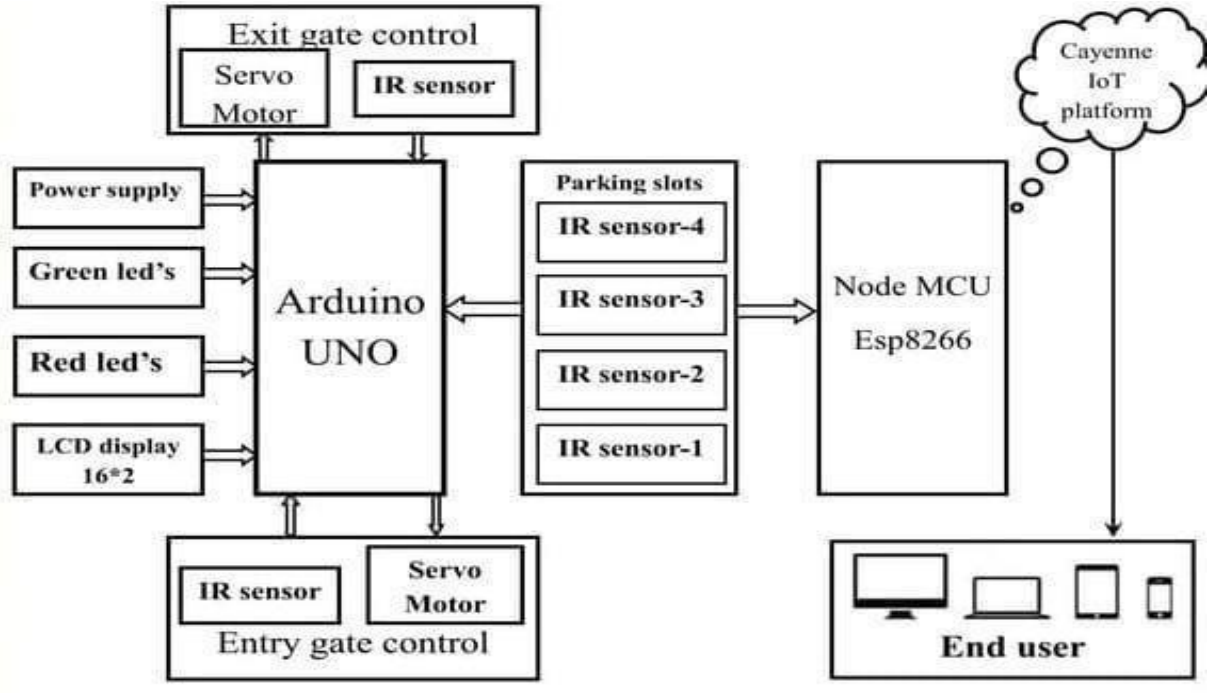

Fig 3.1 Block Diagram

DESCRIPTION

A smart vehicle parking system utilizes advanced technologies such as sensors, cameras, and connectivity to streamline and optimize the parking process. It enables real-time monitoring and management of parking spaces, providing users with information on available spots and guiding them to the nearest open space. The system may incorporate mobile apps for convenient booking, payments, and navigation. Additionally, data analytics can be employed to analyse parking patterns, improving overall efficiency and reducing congestion. With automated features, such as license plate recognition and automated payments, it enhances the user experience while promoting efficient use of parking resources.

3.3 PROJECT-TOTAL COST

S.NO	COMPONENTS DESCRIPTION	QUANTITY	COST (Rs)
1	Arduino uno	1	504
2	IR sensor module	4	500
3	Servo motor	1	235
4	16*2 LCD(I2C)	1	345
5	Jumper wire	20	184
6	Perf Board	1	210
7	Card Board	1	212
TOTAL			**2190**

Table 3.1 Project-Total cost

CHAPTER 4

RESULT AND DISCUSSION

4.1 HARDWARE COMPONENT DESCRIPTION

IR SENSOR MODULE

An IR sensor module detects the presence of vehicles by emitting infrared light and measuring the reflection. When a car is present, the IR light is reflected back to the sensor, indicating the parking spot is occupied . This data is then used to monitor and manage parking space availability in real time, enhancing efficiency and user convenience.

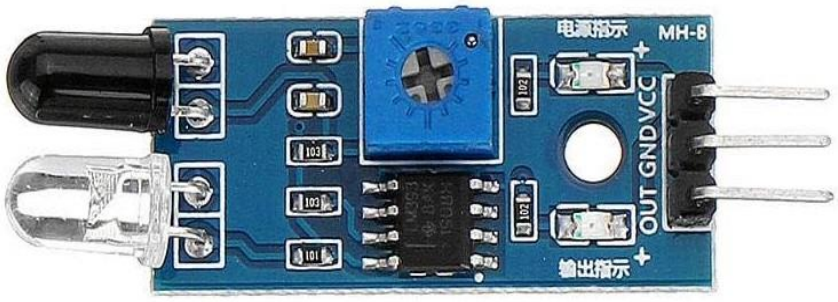

Fig 4.1 IR SENSOR MODULE

ARDUINO UNO

The Arduino Uno is commonly used in smart vehicle parking systems due to its simplicity and versatility. It can control sensors and actuators to automate parking tasks. Typically , ultrasonic sensors detect the presence and distance of vehicles, relaying this data to the Arduino processes this information to determine if parking spaces are available and can activate indicators such ass LEDs or LCD displays to guide drivers. Additionally, the system can communicate with a central server for real-time parking management and monitoring, enhancing overall efficiency and user experience.

Fig 4.2 ARDUINO UNO

SERVO MOTOR

A servo motor is used to precisely control the movement of mechanical components, such as barriers, platforms, or guidance systems. This ensures accurate positioning and smooth operation, facilitating efficient and automated parking processes. The servo motor's ability to provide precise control makes it essential for tasks requiring high accuracy and reliability in smart parking solutions.

Fig 4.3 SERVO MOTOR

4.2 HARDWARE KIT

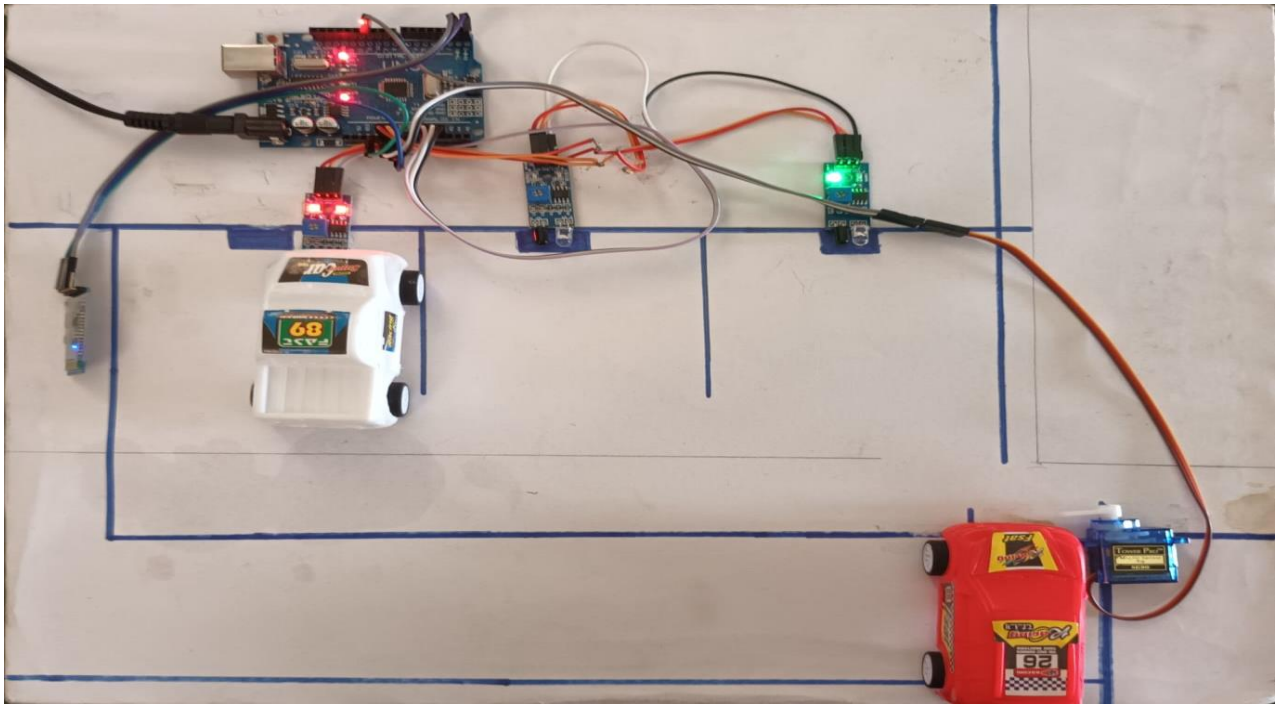

Fig 4.4 HARDWARE KIT

4.3 WORKING PRINCIPLE

When car enters the parking area IR sensor (Infrared sensor) that is present before IN gate will detects the passing vehicle and the gate will opened automatically. The car will enter into the parking area at that time person doesn't know which slot is empty, for this there will be an indication of LED's for every slot when the Green light glows the slot is empty when the red light glows the slot was filled. By this the person easily know which slot is empty .The operation of exit side will be same as that of the entrance .When the car is leaving the parking area, the IR sensor that is present before OUT gate will detect the passing vehicle and the gate will be opened automatically. This information is then processed and displayed through mobile apps, guiding drivers to available parking spaces, reducing the time spent searching for a spot. The overarching goal is to streamline the parking process, improve traffic flow and reduce emissions from vehicles.

CHAPTER 5

CONCLUSION

The implementation of a smart vehicle parking system marks a significant step toward modernizing urban infrastructure. By leveraging IoT, sensors, and real-time data analytics, these systems optimize the use of parking spaces, reducing the time drivers spend searching for spots and consequently decreasing traffic congestion and emissions. This not only enhances urban mobility and air quality but also improves the overall convenience and efficiency for drivers, offering features such as real-time availability updates and advanced reservation options.

Beyond immediate user benefits, smart parking systems provide substantial advantages for city planners and parking operators. The dynamic pricing and detailed usage data these systems offer help maximize revenue and ensure optimal resource allocation. Additionally, the insights gained from the collected data can inform more strategic urban planning and development, contributing to the creation of smarter, more sustainable cities. In essence, smart vehicle parking systems are a crucial component in addressing urbanization challenges and enhancing

POST IMPLEMENTATION SURVEY FORM

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PROJECT IMPLEMEMTATION – GEOTAG PHOTO

PROJECT DEMONSTRATION VIDEO LINK :

https://drive.google.com/file/d/1zTjd6FMDKUBwW1qgdFjvKwhkYlQ04mNy/view?usp=drivesdk

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