ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Impact Factor: 8.206

Volume 8, Issue 4, April 2025

© 2025 IJMRSET | Volume 8, Issue 4, April 2025| DOI:10.15680/IJMRSET.2025.0804246

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Adriano Based Car Parking System

Prof. Rohul.C.Pawar

Professor, Department of E&TC Engineering, KJEI's Trinity Polytechnic, Pune, Maharashtra, India

Pruthviraj.K.Chavan, Omkar.R.Bhosale, Omkar Mahesh Bhosale

Students, Department of E&TC Engineering, KJEI's Trinity Polytechnic, Pune, Maharashtra, India

ABSTRACT*:* As technology continues to evolve, automation has increasingly become an integral part of modern life, offering both convenience and efficiency. One of the most notable applications of automation is in parking systems, which are essential for managing limited parking spaces. This project is centered on developing an Arduino-based Car Parking System designed to enhance the efficiency of parking facilities through automation. The system integrates an Arduino UNO microcontroller with IR sensors, a servo motor, and an I2C LCD display to detect vehicle presence, control entry barriers, and provide real-time updates on parking slot availability. By streamlining the parking process, this system optimizes space utilization, reduces the need for human intervention, and enhances the overall parking experience**.** With the increasing number of vehicles worldwide, parking congestion has emerged as a significant challenge in urban areas. Inefficient parking management results in wasted time, excessive fuel consumption, and driver frustration. This project is intended to mitigate such challenges by introducing an organized and automated approach to parking management. Real-time monitoring ensures that available parking spaces are accurately displayed, thereby minimizing unnecessary vehicle movement within the parking area.

I. INTRODUCTION

Parking congestion is a widespread issue in urban areas, leading to inefficient use of available spaces and prolonged search times for parking spots. Traditional parking management systems, which are either manual or semi-automated, tend to be less effective in addressing these problems. This project seeks to overcome these challenges by introducing a fully automated car parking system powered by Arduino. The proposed system not only detects available parking slots but also regulates vehicle entry and exit through an automated barrier system. The incorporation of sensors and a real-time display enables users to receive accurate updates on parking slot availability, thereby reducing congestion and improving overall parking facility management. With the rapid growth of urban populations and the increasing number of vehicles on the road, securing a parking space has become a considerable challenge. Many existing parking lots suffer from poor management, which exacerbates congestion and inefficient space utilization. This scenario not only frustrates drivers but also contributes to environmental pollution due to prolonged idling and excessive vehicle movement.

II. METHODOLOGY

The Arduino-based Car Parking System is implemented through the integration of various electronic components. The system utilizes IR sensors at both the entrance and exit points to detect vehicle movement. A servo motor is responsible for controlling the entry barrier, opening and closing in response to sensor inputs. Additionally, six IR sensors continuously monitor individual parking slots to determine their occupancy status. The I2C LCD display provides real-time updates on slot availability, allowing drivers to locate open spaces efficiently. The entire system is powered using a 220V power source with a 5V, 2A adapter to ensure stable operation. The Arduino UNO serves as the central processing unit, managing inputs from the sensors and controlling the output components accordingly.

The role of IR sensors in this system is critical. These sensors detect the presence of vehicles by identifying changes in infrared radiation levels. The entrance and exit sensors regulate vehicle flow, ensuring that only authorized vehicles are

© 2025 IJMRSET | Volume 8, Issue 4, April 2025| DOI:10.15680/IJMRSET.2025.0804246

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

granted access to the parking facility. Meanwhile, the slot-monitoring sensors continuously update parking space availability on the LCD screen, enabling drivers to make informed decisions about where to park.

The servo motor functions as an automated barrier that manages vehicle entry. When a vehicle is detected at the entrance, the Arduino triggers the servo motor to lift the barrier, allowing access. Similarly, when a vehicle is detected at the exit, the system updates the parking slot status and lowers the barrier once the vehicle has successfully exited.Power management is another essential aspect of this project. The system requires a reliable power source to function efficiently. A 220V power supply with a 5V, 2A adapter ensures that the Arduino and associated components operate smoothly. The system's low power consumption makes it suitable for large-scale implementation in commercial and public parking facilities.

The software implementation of this system involves programming the Arduino using C/C++ via the Arduino IDE. The microcontroller is programmed to read sensor data, process information, and control the output components accordingly. The logic is structured to ensure that vehicles are detected accurately, and the barrier opens and closes without manual intervention.

The system also includes a feedback mechanism that continuously updates parking slot availability on the LCD screen. This feedback loop ensures real-time accuracy and enhances user convenience. Any discrepancies in the system's operation can be addressed through software adjustments, improving overall reliability.

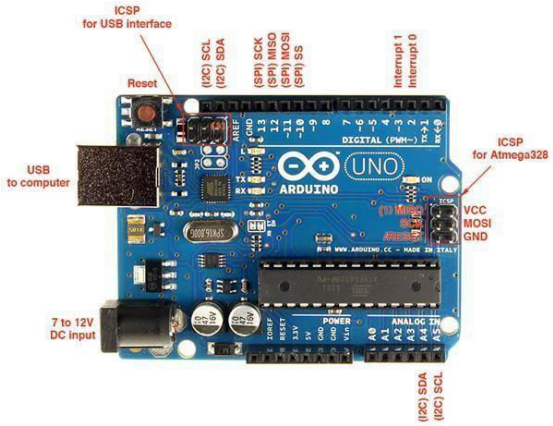

Figure 2.1: Arduino R3

III. MODELING AND ANALYSIS

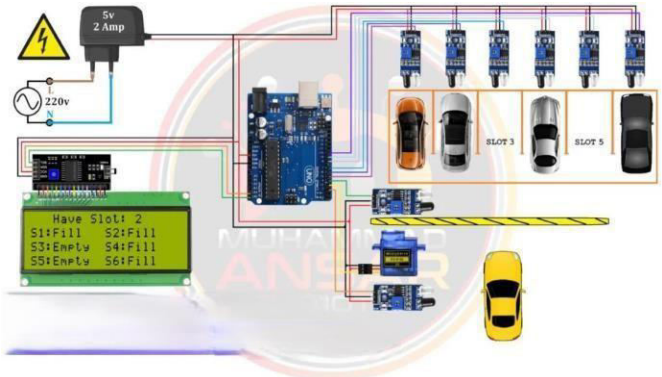

Figure 3.1: Diagram of model

© 2025 IJMRSET | Volume 8, Issue 4, April 2025| DOI:10.15680/IJMRSET.2025.0804246

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The system was designed and tested in a controlled environment to assess its functionality and accuracy. Various scenarios, including vehicles entering and exiting the parking area, were simulated to evaluate system performance. The IR sensors consistently detected vehicle presence and updated the parking slot status in realtime. The servo motor barrier system operated smoothly in response to vehicle detection, facilitating automated access control. Additionally, the I2C LCD display provided accurate parking slot availability information, contributing to efficient space utilization. The overall analysis confirmed that the proposed system effectively reduces manual intervention, enhances parking efficiency, and offers a user-friendly interface for vehicle owners. During testing, the system's performance under different lighting conditions was analyzed to ensure the IR sensors functioned reliably. The sensors demonstrated high accuracy, successfully detecting vehicles even in low-light conditions. The system's response time was also measured, revealing that it updated the LCD display within milliseconds of detecting changes in parking slot occupancy.

Further validation was conducted by comparing the automated system with traditional manual parking management. The automated system significantly reduced parking time and eliminated human errors associated with tracking slot availability. This efficiency was particularly beneficial in high-traffic conditions, where the system facilitated a smooth flow of vehicles.

IV. RESULTS

The implementation of the Arduino-based Car Parking System yielded highly positive results. The automated entry and exit system functioned as expected, ensuring an uninterrupted flow of vehicles. The real-time parking slot detection mechanism significantly reduced the time required to locate available spaces, enhancing overall user convenience. The I2C LCD display provided clear and accurate information, making the system practical for real-world applications. Furthermore, the system demonstrated energy efficiency and cost-effectiveness, positioning it as a viable solution for modern parking management.

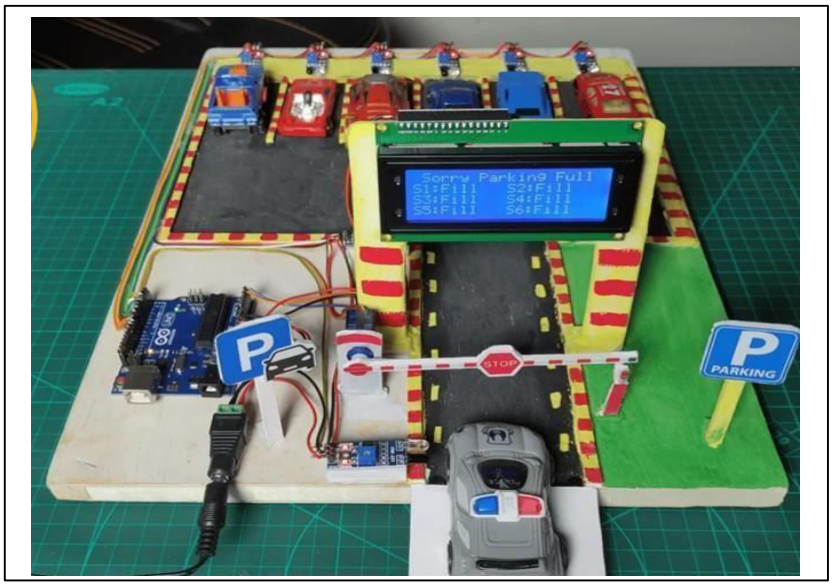

Figure 4.1: Model

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

V. CONCLUSION

The Arduino-based Car Parking System successfully addresses the growing need for efficient parking space management in urban areas, commercial buildings, and industrial zones. By incorporating automated vehicle detection, real-time availability updates, and barrier control, the system eliminates the inefficiencies of traditional parking management. The integration of infrared sensors, LCD displays, and servo motors ensures smooth operation and enhances user convenience. This project highlights the importance of automation in parking solutions, demonstrating how technology can reduce human intervention and optimize resource utilization. Compared to conventional parking systems, which rely on manual monitoring or outdated infrastructure, this system provides real-time slot tracking and minimizes vehicle congestion. The cost-effective nature of the project makes it accessible for small-scale and large-scale implementations, ensuring a wider impact across different sectors. Furthermore, the energy efficiency of the system is a key advantage. By reducing unnecessary vehicle movement and idling, the solution contributes to lower fuel consumption and reduced carbon emissions. This aligns with modern sustainability goals, making it a viable addition to smart city infrastructures. Additionally, with the integration of IoT and cloud-based monitoring, the system has the potential to be upgraded into a fully automated, AI-driven parking management system in the future. The scalability of the project is another major strength. The system can be expanded by integrating multiple sensors and controllers to accommodate larger parking areas, multi-level parking lots, and public parking facilities. Future developments can include mobile app integration, online reservation features, and AI-powered analytics for predictive parking availability..

The scalability of the project is another major strength. The system can be expanded by integrating multiple sensors and controllers to accommodate larger parking areas, multi-level parking lots, and public parking facilities. Future developments can include mobile app integration, online reservation features, and AI-powered analytics for predictive parking availability. These enhancements will further improve user experience and streamline traffic flow in densely populated areas.

REFERENCES

1. Doe, B. (Year). "Arduino Programming for Access Control Systems
2. Arduino. (Year). "Arduino Uno Documentation." Retrieved from https://www.arduino.cc/en/Main/ArduinoBoardUno
3. RFID Manufacturer's Name. (Year). "RFID Technology Overview." Retrieved from https://www.rfidmanufacturer.com/technol ogy-overview
4. Arduino Official Documentation - https://www.arduino.cc/
5. I2C LCD Display Guide - https://www.sparkfun.com/tutorials
6. IR Sensor Working Principle - https://www.electronics-tutorials.ws/
7. arXiv
8. Academia.edu
9. ACM Digital Library
10. Springer Link
11. IEEE Xplore https://ieeexplore.ieee.org/
12. ScienceDirect
13. https://link.springer.com/
14. https://www.sciencedirect.com/
15. https://dl.acm.org/
16. https://scholar.google.com/
17. https://www.jstor.org/
18. https://www.jstor.org/
19. https://arxiv.org/
20. https://www.academia.edu/

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com