

Automatic car parking system

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Abstract

This project presents an Automatic Car Parking System using Arduino Uno, designed to simplify parking management in modern areas. The system uses IR sensors to detect the presence of cars in parking slots and servo motors to automatically control the entry and exit gates. A 16x2 I2C LCD display shows the number of available slots or a "PARKING FULL" message when all slots are occupied. The system reduces human effort, saves time, and enhances efficiency in parking spaces.

Introduction

With the increasing number of vehicles, managing parking spaces efficiently has become a major challenge in urban areas. Manual parking systems often lead to congestion and wasted time. The Automatic Car Parking System aims to automate this process by detecting empty slots and controlling gate operations automatically. The project integrates IR sensors, Arduino Uno, and servo motors to provide a compact, low-cost, and reliable parking control solution suitable for malls, apartments, and offices.

Literature survey for problem identification and specification

Literature survey:

1.Existing parking systems are either expensive, complex, or require network connectivity. The proposed system provides a low-cost automatic car parking system using Arduino Uno that automatically detects available slots and controls entry/exit gates using IR sensors and servo motors

2.The robot/vehicle must detect available parking slot(s) within the parking area.

3. It must plan a collision-free path from the entry or current position to the selected slot.

4.It must maneuver the vehicle autonomously into the slot (including reversing if needed) and align the vehicle within acceptable tolerance.

5 Need to reliably detect free parking slots in varied lighting/obstruction conditions.

6.Occupancy changes dynamically (cars move); system must update in real time or near-real time.

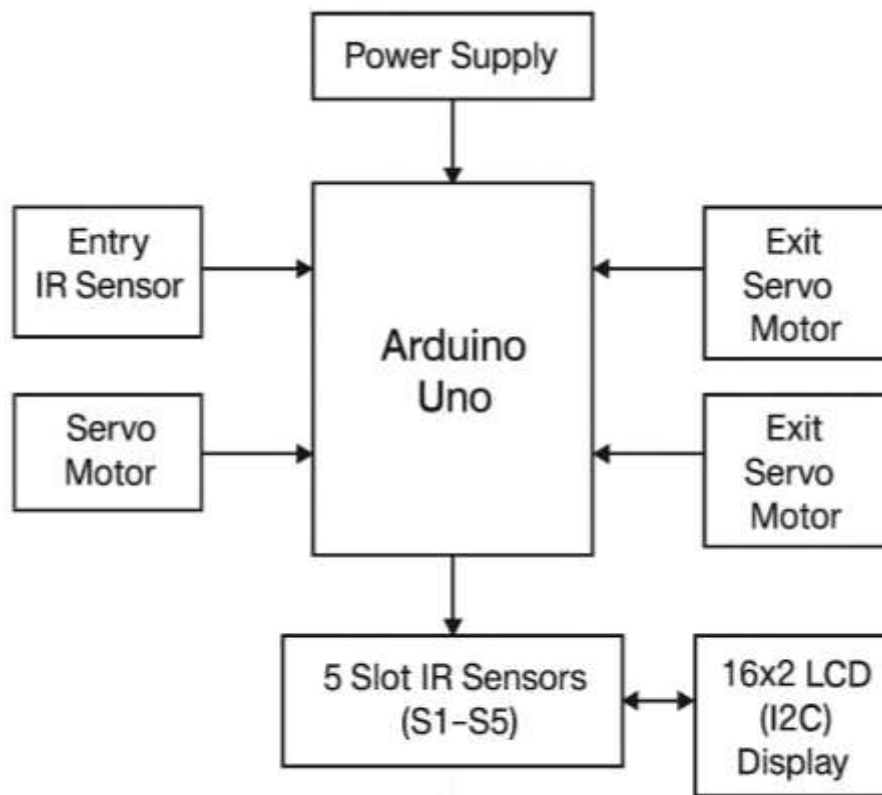
7.Depth/space estimation: verify that vehicle (or robot) can fit in the slot (size constraints).

Project Objectives

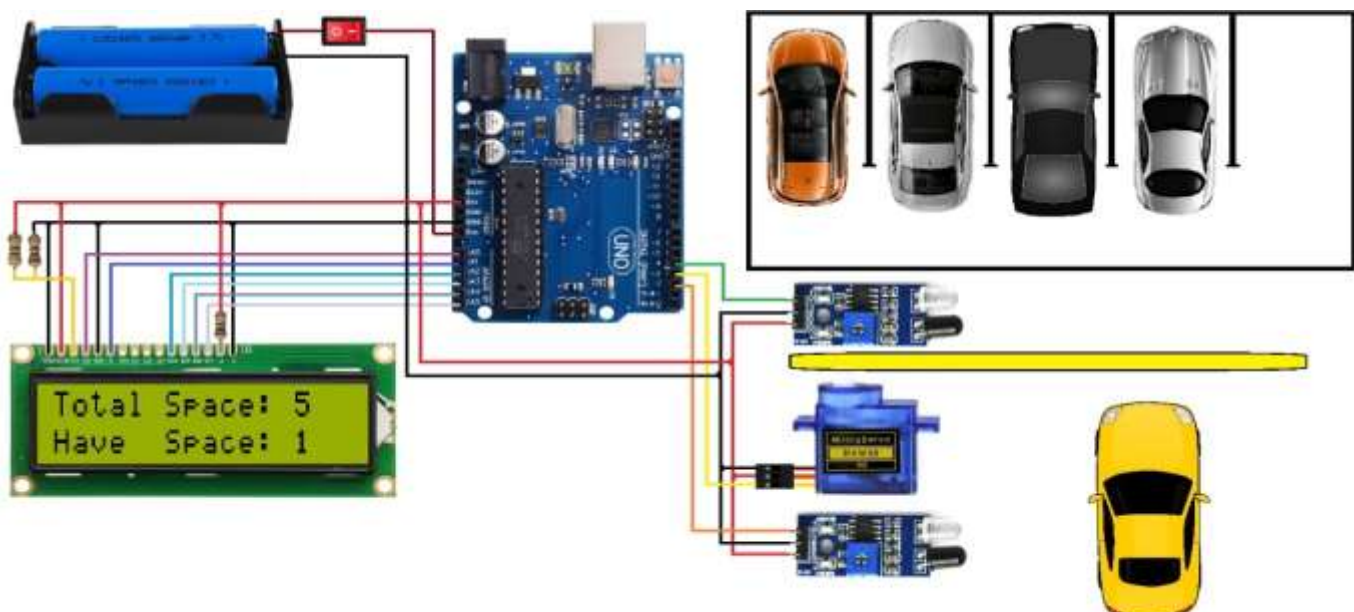
The system will play an important role in improving the customer experience, following are the primary objectives of the system.

- To design and develop an autonomous robot capable of parking itself.
- To detect obstacles and free parking space using sensors.
- To perform parallel or perpendicular parking automatically.
- To improve accuracy and reduce human effort in vehicle parking.

Block Diagram



Circuit diagram



Working

1. IR sensors detect the presence or absence of cars in each slot.
2. When a car arrives at the entry gate, the entry sensor detects it.
3. If there is at least one empty slot, the Arduino Uno activates the servo motor to open the gate.
4. The LCD display shows the number of free slots.
5. When the parking is full, the entry gate remains closed and 'PARKING FULL' is displayed.
6. The exit sensor detects when a car leaves, and the exit gate opens automatically, updating slot count.

Expected Result

The system will automatically open the gate when a car arrives and slots are available.

The LCD display will show the number of free parking slots

.When all slots are occupied, the entry gate remains closed and the message 'PARKING FULL' is displayed. The system provides real-time monitoring and efficient parking control.



Conclusion

The Automatic Car Parking System using Arduino Uno demonstrates an efficient and cost-effective solution for managing parking spaces in modern environments. By integrating sensors (such as ultrasonic sensors), microcontrollers, and display units, the system is capable of detecting vehicle presence and guiding drivers to available parking spots in real time.

This project improves space utilization, reduce traffic congestion, and minimizes the time spent searching for parking. Additionally, it enhances user convenience and can be further expanded with features like IoT connectivity, mobile app integration, and automated payment systems.

Reference

Arduino.cc – Official Arduino Documentation

Research paper on 'Smart Parking System using Arduino and IoT', IJERT, 2022.

Tutorials Point – Servo Motor and IR Sensor interfacing with Arduino

Electronics ForU – Automatic Parking System Project using Arduino Uno

Arduino Official Website – Documentation, tutorials, and code examples for Arduino boards.

Instructables – Contains step-by-step guides for Arduino parking systems.

Electronics Hub – Provides detailed explanations of automatic parking projects.

IoT Based Smart Parking System Using Wireless Sensor Networks” – Published by Springer.

“Automated Parking Management System Using Microcontroller” – Available via ScienceDirect.

“Smart Parking System with Real-Time Monitoring” – Found in IJERT.