



Arduino Based Smart Car Parking

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ABSTRACT

Nowadays, finding an available parking space can be considered as time and fuel consuming in metropolitan cities. This paper explains the architecture and design of Smart car parking based on Arduino. Our system design is used to eliminate unnecessary time conception to find an empty park space depending on the number of unoccupied slots in the parking area and if it does not find an empty slots in parking area the barrier will not open and display the message that parking is full. Using this system we also save more than 20-30% of fuel wastage in search of car parking.

Keywords: Smart Car Park, Parking lots, Parking Problem, Arduino Uno, IR sensor, Servo Motor, Display

1. INTRODUCTION

As quote says " why walk when drive " that is when journey on wheels started and which has created hard ongoing problem to park vehicles into parking slots in urban cities as population is going on increasing the production of vehicles has also increased but parking space available has become congested to park N number of vehicles out of that people are finding it a great problem to search the available space during peak hours and festive times which consumes lot of energy and waste valuable time which is a major drawback[8] in metropolitan cities. The parking problem causes air pollution and traffic congestion. In today's scenario, parking space is hard to search in a day to day life for the people. According to the recent survey, there will be a rapid increase in the vehicle's population of over 1.6 billion around 2035. Around one million barrels of world's oil is being burnt daily. Thus, smart parking system is the key solution to reduce the wastage of the fuel. The smart parking can be a solution to minimize user's time and efficiency as well as the overall cost of the fuel burnt in search of the parking space [10].

In the current parking lot, the systems have no computerized system to store our car. Until now, the entire vehicle parking system is managed through the manual process. The main problem with this manual system is the loss of time and the search for optimal parking for the vehicle. Sometimes vehicle users can search in another parking area and the slot has no vehicle availability. Therefore, this causes a fuel management problem and traffic can also occur [5]. But using Arduino based car parking system it will help the driver to display the parking slot if available and if the parking slot is full the message will display on the screen "Sorry no parking space" and the barrier gate will not open. This will save the time of the driver to search parking in other location. This smart car parking requires arduinouno, IR Sensor to detect the car, servo motor use to open /close the gate and display to display the message.

2. LITERATURE SURVEY

HemantChaudhary, PrateekBansal, ICACCS [1]:In this paper they explain the architecture and design of Arduino based car parking system. They will give authorization card to each user, which carries the vehicle number or other details. If the user is authorized and space is available in the parking, then the parking gate will open and the user is allowed to park the vehicle in parking place else the user is not allowed even the user is authorized person.

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It solves the parking issue in urban areas, also provides security to a vehicle and an unauthorized user is not allowed to enter into a parking place. It helps to park vehicle in multi-floored parking also as it will display which floor has free space.

M Sodiq , H Hasbullah ,ISMEE[2]: . In this paper they introduce one solution to reduce car parking problem is to use a rotary parking system. The rotary parking design uses 6 parking shelves that arranged vertically and rotate. It is an automated parking system that utilizes relatively narrow space using a rotation system. The Arduino Uno module is used as the controller that governs all the devices. The results are done by running the rotary parking system and the system can function properly.

Maher Hassan Kadhim, IJET[3]: In this paper they introduce. a smart parking system based on Arduino components, website and mobile application. The system helps drivers to find an empty park space depending on the number of unoccupied lots in the park. This can increase the economy by reducing fuel consumption and pollution in urban cities. Moreover, it helps to reduce the time of finding car lot. Also, it helps the driver to find his car when he forgets the car location easily. Finally, the system shows the reserved, booked and empty lots in park for staff and drivers.

Mohammed Omar Ba Sabbea, MuhammedIrfan, SaeedKaramaALtamimi, SaeedMabkhotSaeed, A. H. M. Almagani, HishamAlghamdi, JACE[4]: In this paper they explain the developed system that has capability to control the entry of authorized vehicles in parking area and block unauthorized vehicles.

M. Kannan , Mrs. L. William Mary , Dr. C. Priya , Dr. R. Manikandan ,IEEE [5]: In this paper they proposes a new architecture with an algorithm for better to park the vehicle further in this document, examine the parking availability status of the registered and / or reserved vehicle to park the vehicle and examine the sensor-based intelligent parking system. The main intention of the car parking system is to distribute the slot in the parking area without becoming rigid for vehicle parking.

3. MATERIAL AND METHOD

3.1 Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

3.2 IR Sensor

An infrared sensor is basically an electronic device which is used to detect the presence of objects. Infrared light emitted by this device. If this device does not detect any IR light reflected back that means there is no object present. If the light is detected by the sensor there is an object present.

3.3 Servo Motor

A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

3.4 Jumper Wires

Jumper wires are used for making connections between items on your breadboard and your Arduino's header pins. Use them to wire up all your circuits.

3.5 LCD Display (16x2):

The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. *16x2 LCD* is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8x1, 8x2, 10x2, 16x1, etc. but the most used one is the 16x2 LCD. So, it will have (16x2=32) 32 characters in total and each character will be made of 5x8 Pixel Dots.

3.6 Breadboard(x1)

Breadboard is a way of constructing electronics without having to use a soldering iron. Components are pushed into the sockets on the breadboard and then extra 'jumper' wires are used to make connections.

3.7 Hardware Connection

The hardware connection to implement the circuit

- Take IR sensor an connect VCC pin to the positive rail of the breadboard , GND pin to negative rail of the breadboard and connect out pin to the digital pin(2,4) on the arduino.

- Take Servo motor an connect 5V pin to the positive rail of the breadboard, GND pin to negative rail of the breadboard and connect the PWM pin to the digital pin (-3) on the arduino.
- Take 16x2 LCD Display and connect the I2C Module with it by connect I2C module it make connection simple with 4 pin i.e GND,VCC,SDA,SCL.
- After the LCD is Connected with I2C Connect Gnd pin to the negative rail of the breadboard, VCC pin to the positive rail of the breadboard and connect SDA and SCL to the Analog Input (A4,A5) to the arduino.
- Finally, connect Arduino board to the Computer with the help of USB cable to give power supply to the board and also use to upload the code to arduino board.

4. IMPLEMENTATION

This section will contain the implementation of the proposed system. Every user who enter the parking area will be come in-front of IR sensor .When the IR sensor detect the car it will send the message to arduino and arduino will check whether the parking space are free or not, if the slot has some empty parking space the message will display thanks you and show remaining slots left and the barrier gate will open the user can park the car in parking field, and if the slot is not empty the barrier gate will not open and in display the message will occur that “sorry no parking space”.

5. DISCUSSION OF VEHICLE REPORT

Traffic is one of the globalized problems due to global warming. Traffic creates numerous problems for both humans and nature through the emission of CO₂. All countries face this traffic day by day. Because of the traffic, people waste precious time and have spent a lot of money on it. So, in this section, we fully know the traffic index in the Indian country[5].For this discussion, all traffic-based data from [17] and [18] are collected.

Table 1: Vehicle Usage Index

Name of the Vehicle	People Used(in percentage)
Car	39.6%
Bike	19.8%
Bus	10.9%
Motorbike	8.9%

In all the worlds, people have commonly used motor vehicles to move from one place to another. Simultaneously, Here we will take an example of an Indian country, how many groups of people have used types of vehicles to change the place. This will be shown in the previous table 1. The traffic Index in India is 205.63 and CO₂ Emission Index is 6012.96. Due to travelling, per passenger is produced yearly 1,443.11 kg of CO₂. In India the top 5 States that have traffic problem is Delhi, Kolkata, Mumbai, Bangalore, Chennai . The excess of population in cities affected by traffic and CO₂ emission were also exchange. Worldwide, India has a lot of traffic compared to other countries.[5] Finding a parking space is also another tedious task to position the vehicle. To increase car use, we must provide an efficient place to park the vehicle without distracting other.

6. CONCLUSIONS

Today vehicles are an important part of everyone. However, traffic is so common that everyone uses vehicles. Nowadays, finding a parking space is a tedious process to park the vehicle while the user is outside. And providing parking space for the vehicle is also an essential source. This document provides an overview of the smart, intelligent parking agenda for the smart city. Therefore, it is one of the efficient sources, according to the current population survey. This model can reduced congestion on the road, time of users, human power, pollution, security for vehicles.

The project is completed successfully. Once the user is entered in parking slot, if a slot is available then gate will be opened and he will park his vehicle in the available slot. If slot is not available, then the gate will not be opened and he is not allowed to park. If gate will not open then the parking is full and message will display on the screen “Sorry NO Parking”. The project is working fine.

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