

Implementation of Smart Car Parking System using Arduino

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Abstract - Essentially, the main reason for the paper to give the solution related to problems that are faced by people during the parking of their vehicle. This study elaborates on how to decrease the parking issue, which is the major issue of urban cities such as Karachi, Lahore, the traffic in those cities which have been grown up very fast. Finding a car parking in huge cities is not convenient. Nowadays, many unlawful parking areas making cash, and most of them are now not safe. This research aims to make a parking machine for the driver where they can park barring getting in trouble and secure. This system can be implemented or can be used by way of malls, companies, airports, and many different places where we have a massive range of vehicles. The automatic parking device can in most cases be divided into 5 one of a kind sorts (PGSI) Parking Guidance and Information System, Electronic Parking, Automated Parking, Smart Payment System, Transit Based Information System. The model project which is developed with the help of some sensor and other necessary things which is required to develop a proper parking system.

Keywords: Smart Car Parking, Sensors, Arduino, Internet of things

I. INTRODUCTION

Due to the increase in urbanization, the utilization of motor vehicles has expanded, which in flip has led to traffic and parking difficulties. The vastest answer used currently is to expand manpower to deal with such traffic. There are lots of techniques in smart parking already been implemented to bring better services to the drivers and to enhance the long-term management of the existing parking facilities. The real-time monitoring available parking lots and allocates of the suitable parking area by advanced reserves of the characteristic services provided to the drivers. This system can be divided mainly into different types: parking information, and guide system (SIGP), computerized, automated system, intelligent payment system, transit-based information system. Look at the names, these different types with different functionalities from which they face various issues similar to parking facilities. Subsequently, the information will explain the installation and functionalities

are combined with examples that can be found throughout the world. Even in malls, alternate amenities, and business parks, parking of motors has grown to be a serious issue. We get stuck in queues to pay the parking charges. To recall someplace, the automobiles used to role position when three hours lengthy charming transferring pictures exhibit off is, in addition, headache [1].

Therefore, issues like overpopulation and skimpy auto slight auto parking region inevitably plant up. In Asia, the state of affairs is getting worse by way of the truth that roads are drastically limited in contrast to the west (Inaba et al., 2001). Numerous issues have been taken and try to overcome the visitor's problem. Although they rely upon are regularly self-addressed by a number of ways, the paper focuses on the vehicle park administration gadget introduces, which is the smart parking system

In an open-end credit score based primarily on the parking system, when any car arrives, the system helps to allocate parking space automatically. Space is allocated bioengineering the first-rate spot. [2].

Finding a car parking in huge cities is not convenient so, if we go out the first thing in our mind is to behave protected parking. If parking is full, so drivers park wrong, and it makes the motive of traffic. Nowadays, many unlawful parking areas making cash, and most of them are now not safe [3].

Due to this, we decided to make a parking machine for the driver where they can park without getting in trouble and secure. We deliberate about using a system that can get rid of this hassle by the use of special techniques. This system can be carried or can be used by way of malls, companies, airports, and many different places where we have a massive range of vehicles. This gadget will update every minute. This project will use a unique software program and hardware for a run of this system and tested in two ten-lot parking lots. After successfully test, we can additionally attempt to check parking slots within a constrained area [4].

II. PROBLEM STATEMENT

In the modern city, there is an increasing number of vehicles day by day. If we make the parking system manually, there can be many issues that come like no idea there is available space for parking or not, which are also valuable time wasted extra fuel consumed while move aimlessly or lazily during driving every side parking allows. 30% of urban crowding is created by vehicles owner cruising for parking. [5]

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This gadget can clear up the problems. They are as we apprehend in many buying malls, hospitals website visitors jam in parking neighborhood or the front of the parking. This parking shield stops the entire vehicle and presents a charge slip; it is inappropriate and time losing to discovering out the parking slot, which costs more fuel and wastes time. Security hassle is one every different bother in guide motors parking; the proprietor can enter in a parking slot, and there snatching, theft can happen. In manual parking system defend required to be arranging for the whole job, it is costly enough.

III. LITERATURE REVIEW

Car parking systems have existed almost as quickly as motors have been invented. In any vicinity the place there is a lot of traffic, there are vehicle parking systems. Car parking constructions have been developed in the early twentieth century in response to the need for vehicle region [6]. Smart automobile parking is a system that helps drivers find out an empty seat the use of sensors in each and every parking residence when it detects the presence or absence of a vehicle. Automated parking buildings usually work with electric motors (which pass motors to a storage location). Several parking systems will be brought, and their usefulness in space booking will be explained, and an introduction to absolutely computerized parking will be analyzed, alongside with a number facets that can be used to put into effect it. There will be a little talk about automatic parking as it is often used around. The following are the related work in this undertaking [7].

A. Parking Guidance Information System

PGIS can be categories into two different aspects. This can be carried out to reveal a complete town or surely specific parking. The data supplied by means of way of the device helps drivers make selections about how to attain the deliberate destinations and additionally stumble on the parking residence reachable in the car park [8].

In this smart parking device, all the humans will be really helpful not totally the parking operator and car proprietor even the global virtually because of its surroundings satisfactory while we appear toward the operator, it is handy for him to predict the future parking pattern from the statistics gathered from the clever parking machine [9].

The PGIS can be divided into four gorgeous aspects, namely: data dissemination mechanism, data gathering mechanism, and telecommunications networks.

B. Counter Based Parking

This is one of the parking sorts in which the sensors are placed at the entrance and exit of the parking lot to count number the wide range of motors getting into and leaving the parking lot [10]. This type of parking calculates the large range of reachable parking areas by means of way of subtracting the

range of vehicles registered each time from the sensor placed at the entrance to the whole wide variety of areas registered in the device [11].

C. Transit Based Information System

The transit-based files machine focuses larger on making it easier for drivers to park and force with the aid of skill of supplying real-time statistics on parking space, public transport schedules, and even avenue site visitor's conditions. This greater data is used to furnish drivers with higher avenue planning with the aid of getting rid of inconveniences. Its performance is the same as that of the PGIS [12]. As for the transit-based data system, exceptional benefits are:

- Increase the use of public transport,
- Facilitate public transport transactions through the use of the parking and tour method.
- Increase in profits from transit.

D. Valet Parking

Valet parking is the parking in which automobile is parked for them by using way of a persona called a valet. Many restaurants, hotels, and business workplaces provide this provider to the car owner. But the problem is it requires too many personnel to do this job. It's a fee to an entire lot [13].

IV. METHODOLOGY

The parking system commonly uses ultrasonic sensors, security cameras, or infrared ray sensors to manage the parking areas. We have encountered a number of problems while parking a vehicle, so it is necessary to have a smart car parking system that allows the driver to park their car easily. Commonly there are two types of parking smart parking systems and the traditional parking. The smart car parking system is a long term and cost-effective system.

A. System Application

In this system, we have provided a system application that gives a graphical view to the admin to see whether the car is parked or not.

B. Parking Sensors

For our parking system, we have made use of sensors like Infrared sensors and Ultrasonic Sensors. The work of these sensors is to sense the parking area and determine whether a parking space is available or not and also if the driver parks the car in the wrong space. In this case, we are using infrared sensors to detect the presence of a car.

C. Camera

When the car arrives at the entrance, the camera will detect the card and read the vehicle registration number and send it to the database. The role of the camera is very important because it provides security.

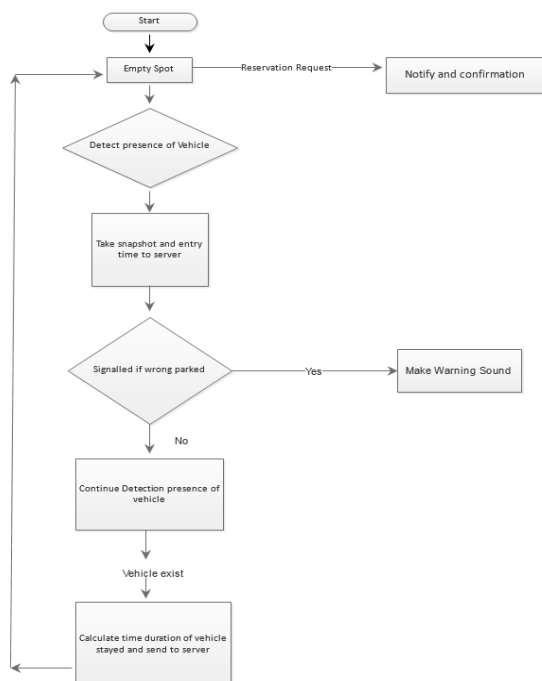


Figure 1 Flow chart explaining the system

D. Servo Motor

Servo Motor is used in our project to open and close the barrier of the entrance and exit area. When the infrared sensor gives a signal to Arduino about the entrance and exit of the car, the Arduino then gives instructions to the servo motor to work.

E. Receipt Printer

When the system assigns parking to the driver, the receipt printer prints a receipt that has the details of parking like the parking slot number, vehicle number plate, date and time, and the charges of parking.

F. Arduino Uno

In this project, we use Arduino Uno to process the system, which contains a processing chip. This processing unit is used to communicate with sensors and servers.

V. IMPLEMENTATION

In the previous section, we talk about the architecture and the methodology we use in our smart parking system. Now let's discussed the implementation and working in a real scenario. The complete procedure of the parking system from start to end is explained in fig 1.

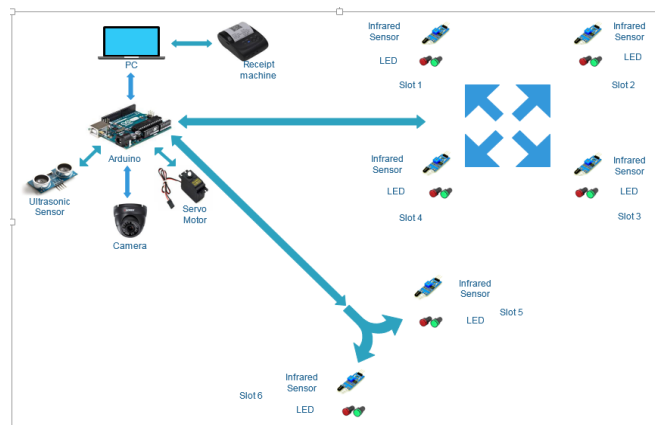


Figure 2 Diagram shows the parking system.

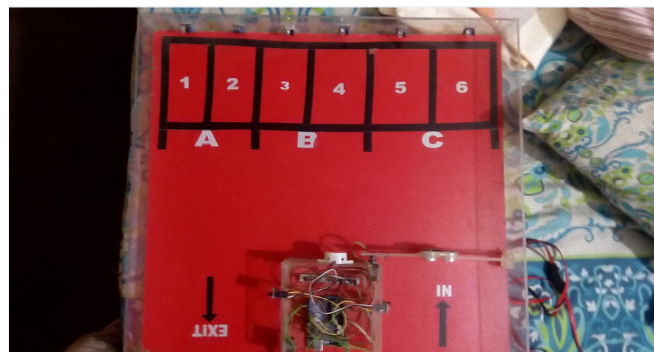


Figure3 Result before the car park

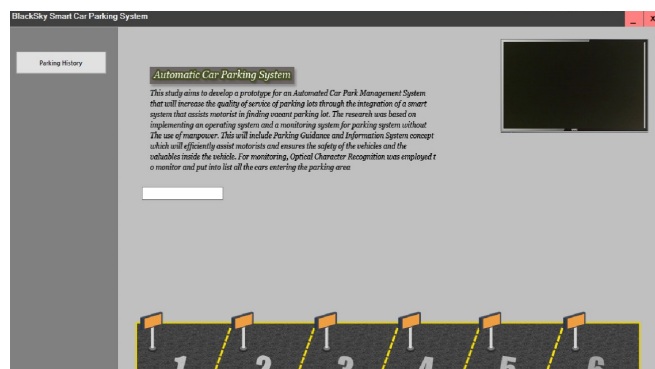


Figure 4 GUI result before the car park

In this system, when the driver comes to the entrance, the I.R sensor detects the vehicle and camera takes the photo of the vehicle registration number, and if the parking space is available, it will generate the receipt which has the slot number, date and time, vehicle registration number and the charges which will be paid at the time of exit. The driver parks the car to the allocated slot number. If the driver parks the car on the wrong space, the I.R sensor will send a message to the server, and the alarm will ring the buzzer. The following figure helps to understand more clearly how the system works. The Basic model of the parking system is shown in fig. 2.

The above diagram represents the system is all connected to

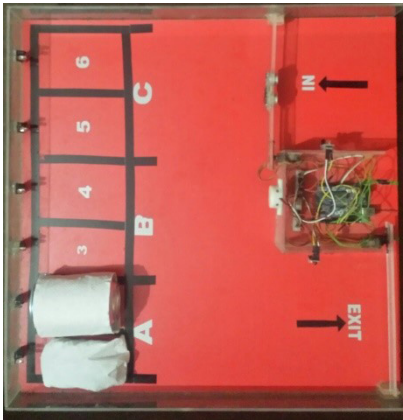


Figure 5 Results after car park

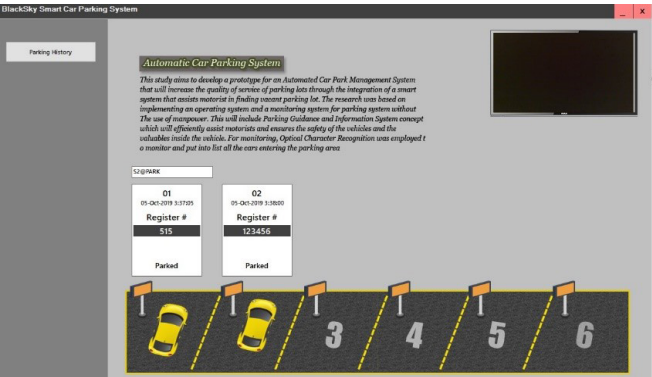


Figure 6 GUI result after car park

Arduino, and Arduino is connected to the main server/pc. The system has a graphical user interface that helps the admin to supervise the parking and to maintain the equilibrium of the parking system [14].

VI. WORKING AND RESULTS

First, we made a model of the project, and after that, we take out some reading. The below figure 3 shows the initial vision of the project.

The figure shows 4 show when the vehicle is not on the parking slot. Figure 3 represents empty parking slots, and parking is available for different vehicles as per sequential order. Figure 4 elaborates on the GUI mechanism used for the parking system.

The figure 5 shows the car is parked by the help of the IR sensor and sends a signal to Arduino, which give instruction to the system that the car is parked on the allocated space or not.

In figure 6, when the driver comes on the entrance gate backend, the software detects and notes down the vehicle number plate, date, and time and gives the receipt. After

allocating driver, the parking slot system will check the car is parked on the right slot or not, if the car parked on the right slot, the GUI shows a car on the slot if the car parked on the wrong slot the alarm will get a buzzer. When the driver leaves the parking system will save the details in the database, if the admin wants to check the details of parked cars so, we created the parking history to check it. Outcome of the system is shown in fig 7.

Entry@1	vehicle 1 are entered	
Parked@1	vehicle 1 are parked	
exit@1	vehicle 1 are exit	
Wrong	on parked wrong slot	

Figure 7 represents the outcome of the project.

VII. CONCLUSION AND FUTURE DIRECTION

Everyone knows that technology is bringing us nearest together, drivers want easier, and without consuming-time parking systems. After analyzing the various solutions, it is noticed that there are some faults in each system like over much utilization of costly sensor modules, trouble in detecting precise parking availability data due to speed constraints of the vehicle, use of certain modules like infrared sensor that function efficiently only for short distance, inefficient driver validation techniques and centralized management of the database of parking areas in different regions. These deformities should be disposed of to improve the general execution of the framework.

Mobile Applications will be introduced to book parking spaces from anywhere, and the mobile application will show the empty spaces of the parking area.

We will add an online payment method by which users can pay parking fees online with their master card or visa card or even in crypto currency.

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