

Raspberry PI Based Intelligent Car Parking System

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Abstract— One of the biggest problems in bustling cities is finding vacant parking spaces. Drivers face huge difficulties when trying to find an apt parking spot. India has one of the lowest vehicles to parking spots ratios across the world. For every 25, 00,000 registered vehicles, our country has a scanty number of 1800 of parking spots. Therefore, there is a need for an efficient car parking system. Our paper proposes an intelligent car parking system that helps driver's book parking spots through a Cloud-based IoT system. The parking spot is then allocated through the Open CV recognition method. Once a driver books a parking slot, a unique QR code is generated unique to them. The QR code helps in monitoring and authenticating vehicles without direct contact. The QR code algorithm updates the information regarding the availability of parking spots in a particular area on a website. After booking a parking slot, the driver's unique QR code is scanned through the Open CV recognition system. This way, unauthorized parking and congestion of parking spots can be reduced drastically.

Keywords— IoT [Internet of Things], Parking, Raspberry Pi, Automation, IR Sensor, QR Code, Python.

I. INTRODUCTION

In today's world, everything around us has become advanced and updated. Technology plays a major part nowadays. Everything around us is technology linked. Intelligent car parking system is one such necessary application for us. Day by day, due to increase in population and traffic, current method of parking management has started facing many cons.

To replace the old method, we can use Internet of Things (IOT) to stay updated about the parking vacancies. Using sensors, one can easily find out if there are any vacancies in the parking lot to park their vehicles. In-ground sensors are used to send messages to the parking officers if there are excess vehicle parked in the specific area. Hence, to our convenience, we can make sure that we park our cars in the correct space.

In this paper, we have proposed an IOT model implementing a spontaneous method that automates car parking.

II. LITERATURE REVIEW

D. Vakala and Y. K. Kolli (2017) et. al.[1]. In this paper, a system is implemented in which drivers find parking slots online and reserve it with an android device.K.Hassoune,W.Dachry,F.Moutaouakkil and H.Medromi (2016) et. al."Smart parking systems": A survey" [2]. As population increases, there is a necessity to increase the production of vehicles, thereby increasing the demand for parking area. This might create chaos in the metro cities. To ensure the availability of parking slots, smart parking systems would help.C. Lee, Y. Han, S. Jeon, D. Seo and I. Jung (2016) et. al. "Smart parking system for internet of things" [3]. Automating various physical devices for the ease of human activities are now a necessity and the internet of things play a vital role in automation. Actuators, sensors along with different software help in connecting objects and transferring data. The priority of government has now shifted in developing smart cities.S.Shine, A. Patil, S.Chavan, S.Desmukh and S. Ingleshwar (2017) et.al. "IoT based parking system using Google" [4]. Parking congestion is mostly caused due to the unavailability of parking slots and the cruising of drivers around the destination to find parking spaces. This affects day to day activities including wastage of fuel, wastage of time, creates frustration to drivers, increases pollution, etc. Hence, this creates a necessity for smart parking system.N.R.N.ZadehandJ.C.D.Cruz(2016)et.al. "Smart urban parking detection system" [5]. With the growth and development in the automobile industry, the demand for vehicles has increased. Eventually, this has created a demand in finding appropriate parking area. P. Sadhukhan (2017) et. al. "An IoT-based E-parking system for smart cities"[6]. Economic behaviour and living standard has increased in the country. This has resulted in a higher growth of population owning automobiles and motorcycles, especially in the metropolitan cities. Parking areas are now a big issue as they lead to a traffic network. To ensure urban life quality, smart parking systems are necessary.

III. EXISTING METHOD

The latest version of parking spaces now available in our country is the multiple stacked parking systems. This is considered to be semi-automatic as the system uses a mechanical system to transport cars from the starting point of the garage to an empty parking space. However, only a very few places have this type of parking system. The conventional parking systems in India are neither automatic nor organized.

Our proposed system brings in order and regulates parking systems to a great extent. It reduces the time, effort, and resources spent by drivers in search of parking slots. Since automation plays a major role in the proposed model, manual work is minimal, when compared to the traditional parking systems. It notifies drivers of the available parking spaces via messages and saves them time and energy.

IV. WORKING OF PROPOSED MODEL

In this paper, the main focus is to identify vacant parking spaces, thereby helping drivers to find a comfortable parking space in a specific parking region with the help of QR code-based parking system which also reduces traffic. We have used parking allotment through Cloud Based Service & based on sensor nodes. Slot booking Verification through QR based image recognition is used to check if the vehicles are registered or not while parking. Here we consider a parking area with three slots, each slot has an IR sensor to detect the presence of vehicle with connected internet & the slot status updated in certain webpage. We are illustrating the design of the proposed model of a QR code based smart parking system, which implements reservation assistance and also provides the details and information regarding the generation of the QR code algorithm.

In our system, the parking slots have IR sensors & Camera with Raspberry Pi Controlling Unit. From detection of IR sensors, car presence or absence is confirmed and then the free slots are displayed. The user can register any free slots available in parking destination place. Immediately a QR is generated to the user.

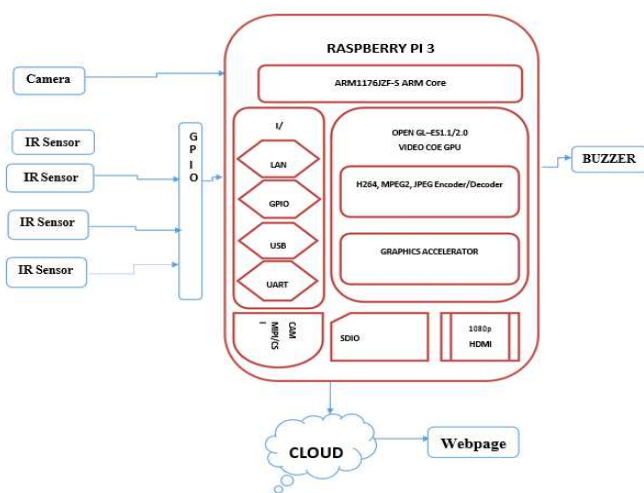


Fig. 1 Block diagram

When the user reaches the destination, the QR code is recognized through the camera and the user is allowed to park in the registered slot. After scanning the QR code, the gate automatically opens using IR sensor and DC motor. Thus, the user can park the vehicle in the allotted slot. If the user scans the QR code in the wrong slot gate will not open and the buzzer alert is given in Fig.1.

V. HARDWARE IMPLEMENTATION

In this proposed model Raspberry pi 3 operating system is used which connected to the monitor using HDMI and VGI cable. The program for minutiae algorithm and database operations is written using PythonIDE3.7. The hardware implementation of the proposed model with all the connections is shown here in the Fig 2. When the user shows the correct QR code the message is passed on to the Raspberry Pi and the gate is opened using the motor. Also, the LCD displays the status of the gate which is shown in the Fig 3 and Fig 4. After the vehicle passes through the gate or if the QR code is incorrect the gate remains closed. The webpage is updated so that the user can check the vacancy for booking their slot. The user can enter their vehicle number and their mail address to receive the QR code thereby booking their slot. The Fig 5. shows the webpage the parking slot. The status of the webpage when the parking area is full is shown in Fig 6. When the user books a vacant slot the QR code which is sent by the system is shown in Fig 7 and the mail received by the user is also given here in Fig 8. The sample of the QR code used is in Fig 9.

The parking charges based on the amount of time the vehicle was parked is calculated in Fig.10 and the user can pay the correct amount not more or less. The LCD at the gate also shows the charges the user has to pay in the Fig.11. The user can verify the amount displayed with the message he received and can interrogate in case of any discrepancy. When there is any flaw detected the LCD shows “Wrong Parking” shown in Fig.12 and some penalty could also be charged.

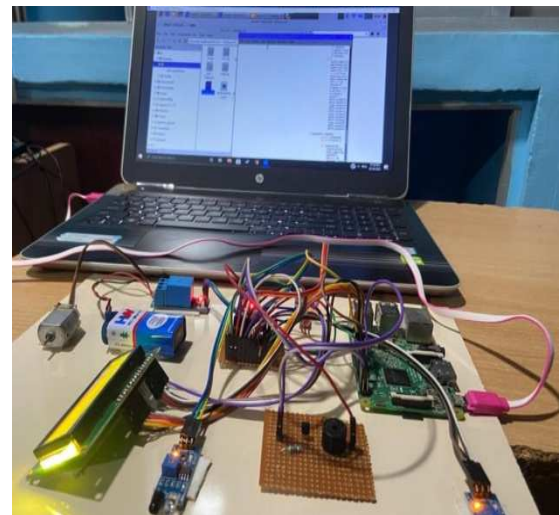


Fig. 2 Hardware Components

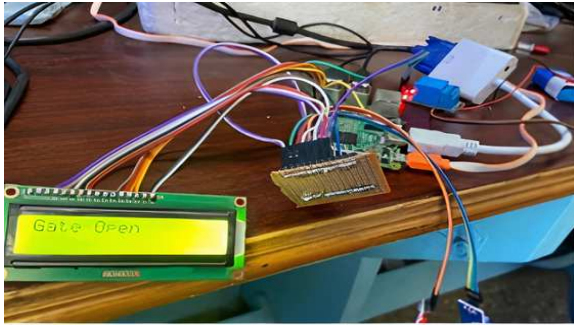


Fig.3 When the Gate is Opened

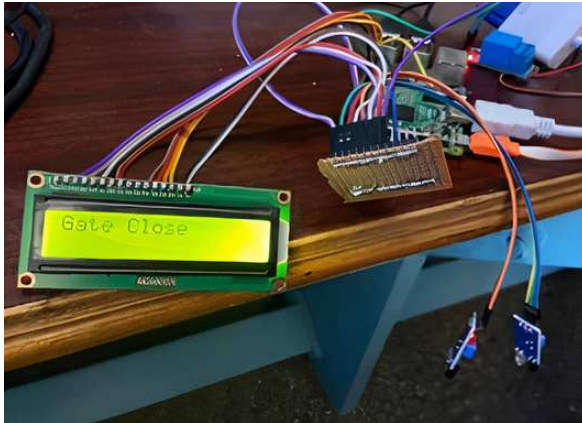


Fig.3 When the Gate is Closed

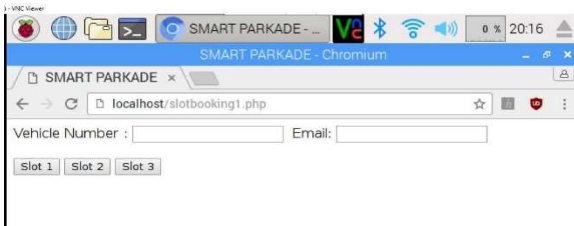


Fig 5. Webpage for Slot Booking

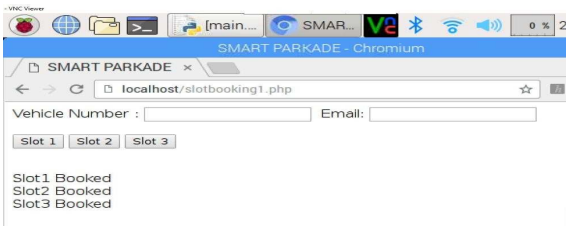


Fig 6. When Slots are Booked

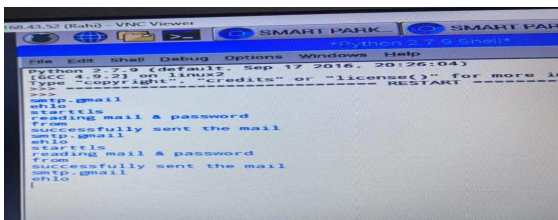


Fig 7. QR code sent to the user



Fig 8. Mail received by the user

QR Code for online Slot Booking



raghulganesh2000@gmail.com



Fig 9. Image of QR code

Your Parking time:42.1588151455Total Fee:Rs.21



raghulganesh2000@gmail.com

Reply

Forward

Fig 10 Received Parking Charges of The Vehicle



Fig.11 Parking Charges received by user



Fig.12 Wrong Parking Shown In LCD

VI. SYSTEM DESIGN

The proposed model consists of a range of hardware components including a Raspberry pi 3 microcontroller, IR sensors, buzzers, and a camera to scan the QR codes. You can refer to the hardware component table for the list of components used in the model.

Raspberry pi 3 is a microcontroller device that has an inbuilt WIFI chip and low-energy Bluetooth. On the lower left side of the circuit board there is a small micro-USB connector through which power is supplied. This microcontroller requires a current of 700mA to operate. IR sensors are being used to detect the presence sensors are being used to detect the

presence or absence of vehicles on the parking slot. This can be monitored from anywhere using IOT. We have also used a round detecting device that has both an LED and phototransistor mounted together. This device transmits a strong signal when it detects blinking. A piezoelectric buzzer that consists of an oscillator is also used here to notify the parking officer when a driver exceeds their parking limit. A camera that converts photographic data to digital data is used here to scan the unique QR code given to a driver.

Computer vision is the process of transforming the data from image into a decision. All these transformations are carried out in order to achieve a particular goal. The input data includes some contextual information. For instance, the image from a camera mounted in any vehicle. Basically, three types of Digital Image Processing are being used.

A color image has the information of the color for each pixel. Each pixel has a particular value which helps to determine its appearance. This value is indicated by three numbers which gives the decomposition of the three primary colors which is Red, Green, Blue. These colors that are visible to human eye are expressed using RGB (RED GREEN BLUE). The decomposition of any color is given by the three primary colors which is represented by a number between 0 and 255. This method is called as RGB encoding and specifically adjusted for human vision. Recommended by the Raspberry Pi Foundation, Python is beneficial for those who are looking to progress from the simple Scratch. In this project, IDE-Integrated Development Environment is written specifically for Python.

VII. RESULT ANALYSIS

Technology is playing a major role in everything. The proposed model can be implemented in busy shopping streets, beaches, and basically any public place. Automatic parking system is a wise choice for places that need to be upgraded, like office spaces. This will result in a better efficiency rate. Shifting to the proposed model has so many advantages. They are time-efficient and safe. The proposed model has the potential of becoming a new business venture, and can bring in revenues. Online payment has become common nowadays. In the intelligent car parking system, an online payment option can be added, if needed. People can park their vehicles as per their convenience. Safety concerns are not a problem here, because everything is automated. The end results are time-efficient and a seamless process.

VIII. CONCLUSION

As the number of vehicles counts are increasing rapidly, the need for a better parking system is required. In the conventional parking methods, parking vehicles are randomly done, and are not completely organized. To overcome all these, our proposed model is suggested to be implemented on larger scales. This project has so many advantages compared to the current method. In the proposed model, benefits like less pollution effects, convenient methods, accurate monitoring, and many more. Smart cities will be completely benefited by using this method. Less maintenance is another factor that encourages us to implement this method. Since we

use IOT in our project, the manpower requirement is minimal. The Python programming language is used for better understanding of the concept. Safety concerns are very important. There will not be any confusion in this system, as everything will be automated and updated to your email. Time management is one of the main goals in this model. To achieve this, the Open CV method is introduced. Open CV method is an added advantage to the whole model. The Open CV method allows the user to find out vacancies for parking their car. People can choose their own parking lot spaces near them and park their vehicles. Thus, choosing technology over anything has become a recent trend. If we make wise use of the idea, this application is useful in our day-to-day lives making it an ideal choice for many countries' development. Advantages are, the safety of your vehicles is assured as the smart parking systems contain and manage real-time data. It will help in avoiding parking violations and malicious activities in secluded areas. The readily available parking spots will also reduce unnecessary traffic caused by exhausted drivers searching for parking spots. These smart parking spots will bring in new streams of revenue. It will also reduce unnecessary manual labour as the process is entirely automated. These smart parking lots also help in reducing resource exhaustion.

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