QR code based Parking System using Raspberry Pi, Open CV, Android Application and IR sensors

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Abstract - *Parking is an underestimated problem which needs to be looked upon seriously. In this project, we bring forward the idea of creating parking system to reduce the man force.Each Android device has the ability to read QR codes and also scanning them bring forward a lot of information.The system scans the number plate of the vehicle about to enter thereby authorizing it. After the scanning he will be able to park on a space based on availability and app will be updated once the vehicle leaves the slot. A bill will be generated based on the usage of the parking slot. This way we basically reduce human effort and errors using the simplest of software and hardware available to us. This system will be performing the work of authorization, slot updation and billing.*

Key Words: QR code, Slots ,Parking,Sensors,Application

1. INTRODUCTION

Two decades ago, parking wasn't an issue since each family had less number of vehicles and there was more space thereby parking vehicle never caused any inconvenience. There was also a time when parking on roads was not restricted. Now with increase in the production of vehicles, diminishing parking spaces and possession of more number of vehicles by an individual, parking has become a huge problem around the globe. Lot of time is wasted in finding a car park. Parking in private zones is incredibly expensive. All these problems can be overcame by appointing a person to look into these problems and assist people find a slot, then calculate the bill for that period. Therefore parking requires an eye 24x7.As the world is progressing into a more digital age, requirement of completion of tasks without human support is increasing. This project addresses the matter of parking faced by people. In this,we have tried to develop a system toreduce human efforts and consumed time by proposing a QR code based parking system which will be suitable for offices, malls and residential societies. The proposed system will be perform tasks like authorization, slot updating and billing. The system will scan the license plate of the vehicle about to enter. This will provide the user authorization. QR codes are unique and can hold a lot of information. This way we grant the permission to the vehicle owner to park the vehicle in the parking zone. The system doesn't require a person to sit down and manually enter the details of the vehicle thus saving a lot of time by speeding up the manual process. Not only this, but also human efforts also minimized. After the vehicle is given authorization by the system, based on availability of slots, the vehicle is allowed to a park on any free slot. Based on the parking costs and policies and the number of hours the slot was used, a bill is generated. Hence, there is a less chance of incurring errors. The systems app gets updated automatically once the slot is emptied.

2. EXISTING SYSTEM

Now a days,common parking guidance approaches have been adopted by drivers. Blind searching is very common approach which is adopted by every driver. Drivers search the parking spaces very randomly. If the driver gets the vacant space he parks his vehicle otherwise his search for the parking space goes on. Parking Information sharing is another way which is adopted by the drivers via calling. But it represents only the current state of the parking spaces .If the driver obtains the information regarding the parking lot which is near to his destination, then the driver automatically gets to know regarding the spaces available in the parking area.So the drivers make the decision of parking by their own .If the parking spaces available in the lot are very few during the busy hours then a lot of drivers struggle for the parking spaces. It also results in overcrowding of vehicles in a particular are or region. Some designers have devised a solution to use a system that publishes the live availability information. Therefore, if a parking lot has very few unoccupied spaces, then the system will display that the parking lot is fully engaged. But it is not easy to determine the accurate information, Hence to overcome the challenges faced above, we have designed a system that can be used on an android smartphone. By using this system, the user can determine the availability of parking spaces prior to entering the parking lot. The system provides a visual display to the user regarding the available parking spaces..So the present system is a little time consuming as well as expensive. Hence it needs to be replaced by a proper system that performs efficiently.

3. WORKING METHODLOGY

The basic block diagram given below in Fig.1 shows us an overview of the proposed system. The system comprises of Raspberry Pi (Model 3b) used as the core of the system.
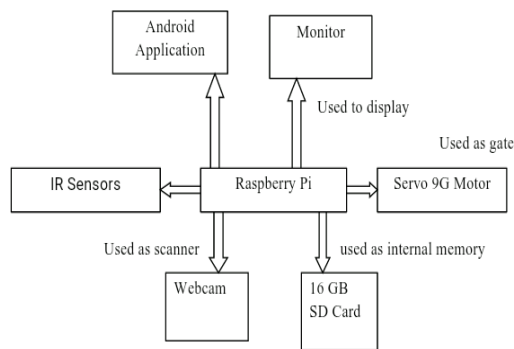
Fig -1: Basic Block diagram of the system

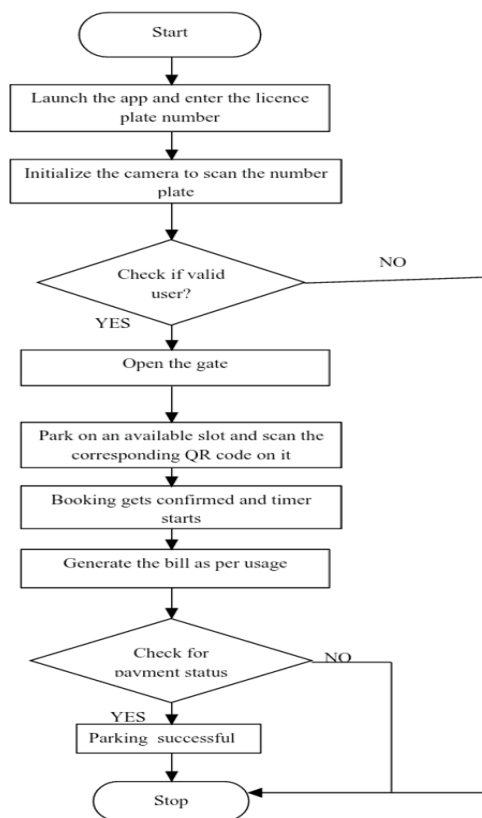The flowchart given below in Fig.2 gives us a run-through of the proposed system.

Fig -2: Flowchart of the system

i) The application is to be launched and the license plate number has to be entered for registration.

ii) As the car approaches the entry gate, the sensor on the entry gate senses the car and the camera is initialized to scan the number plate.

iii) If the user is valid (if the number plate is verified), the user is authorized and the gate opens up, granting the user an entry into the system.

iv) The gate will not open in case the user is unauthorized.

v) The user can park on an empty slot available and then scan the corresponding QR code which is on it.

vi) The user will then get an information about the Place name, License which is the number plate number and slot code.

vii) Then the booking gets confirmed and the timer gets started

viii) A bill is then calculated based on the usage as per time and a receipt is generated.

ix) After the payment is done (via payment page in the application), the user is free to exit the system.

x) The user is also able to check whether there are empty slots in the system as they are updated real time.

4. HARDWARE AND SOFTWARE REQUIREMENTS

a) Raspberry Pi 3 Model-B

Fig -3: Raspberry Pi 3B

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications

b) Servo 9G Motor

Fig -4: Servo 9G Motor

A servo motor is an electrical device which can push or rotate an object.If there is a need to rotate an object at some specific angles or distance, then use servo motor.

c) IR Sensor

Fig -5: IR Sensor

HC-SR505 Mini PIR Motion Sensor is based on infrared technology and it can automatically control by itself with high sensitivity and are highly reliabile. Because of the minimum size and low-power operation mode, it is widely used in various of automatic electronic equipment, especially battery-powered automatic products.

d) Webcam

Fig -6: Webcam

A webcam is a small digital video camera directly or indirectly connected to a computer or a computer network. It is capable of capturing images as well as videos depending on the specifications of it.
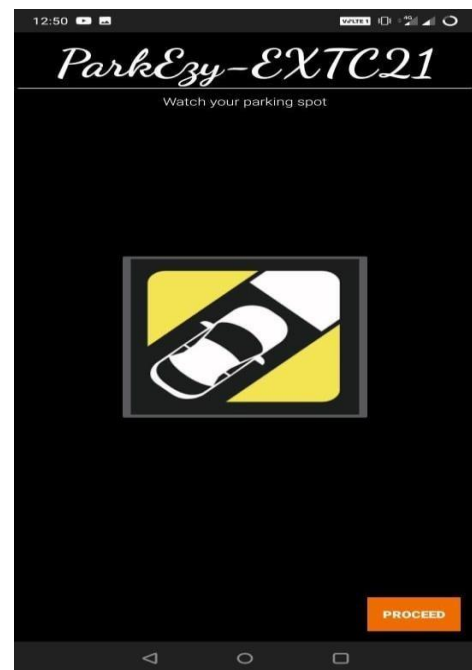
e) Android Application

Fig -7: Android application

Android apps can be written using Kotlin, Java, and C++ languages. The Android tools compile your code along with any data and resource files into an APK, an Android package, which is an archive file with an .apk suffix which contains all the contents of an Android app and is the file that Android-powered devices use to install the app.

f) Android Studio

Fig -8: Android studio

Android Studio is the official integrated development environment (IDE) for Android OS (operating system), built on software and designed specifically for android development.

6. RESULTS

1) System hardware implementation and prototype model

Fig -9: Prototype Model

Figure 9 depicts the hardware used in the system as well as the overall view of the prototype model of the proposed system.
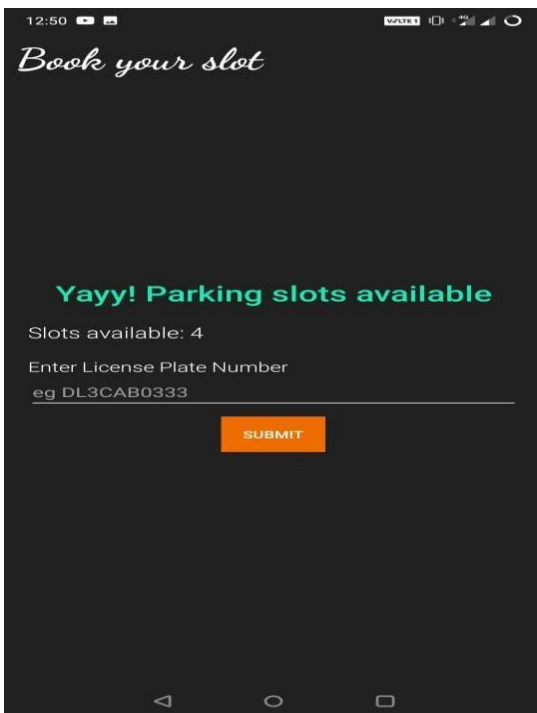
2) Booking Interface

Fig -10: Booking interface

Figure 10 depicts the booking user interface with number of slots available for booking.

3) Scanning of QR code interface

Fig -11: Scanning of QR code

Figure 11 depicts the scanning of QR code available on a slot after successful authorization inside the parking system
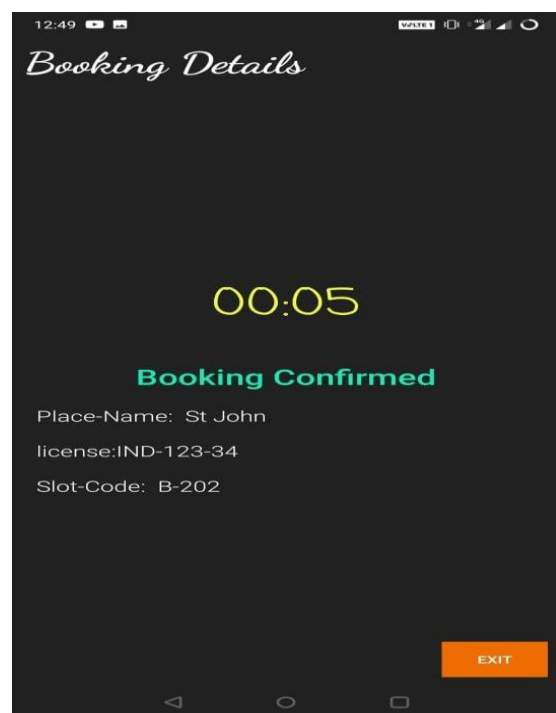
4) Booking Details UI

Fig -12: Booking Details UI

Figure 12 depicts information about booking place,id as well as code of a slot.

4) Receipt Generation interface

Fig -13: Receipt Generation Interface

Figure 13 depicts the receipt generated based on usage of a slot by a user.
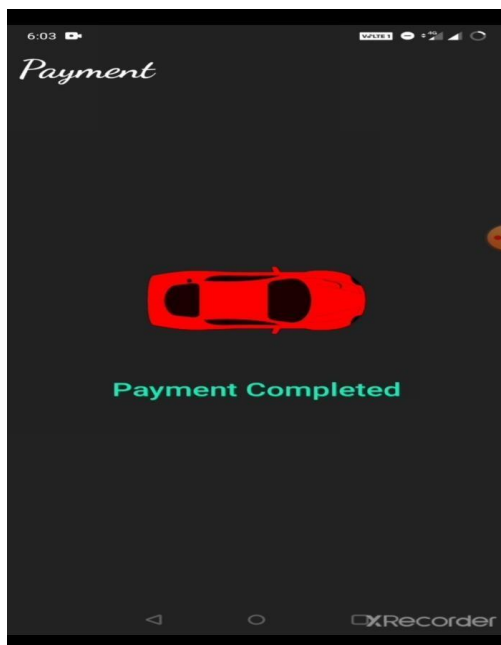
5) Payment Completion interface

Fig -14: Payment Completion interface

Figure 14 depicts the payment completion interface after paying via app for usage of a slot.

6. CONCLUSIONS

This paper summarizes an effective and efficient way to park a vehicle using latest technology. The proposed system is designed for 4 parking slots each having single IR sensor with adjustable sensing range of up-to 20cm.Proposed work not only reduces the traffic congestion, but also provides authentication of the user, cost effective, real time and helps in reducing carbon footprint.These days it is necessary to make use of technology to ease our lives. Simple day to day problems which are becoming huge obstacles in terms of time consumption can be solved by making use of technology. Hence the problem of parking is solved by allocation of spaces in parking slots digitally by using existing and basic technologies to achieve a more compatible and user-friendly system.

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