Smart Mobile Application for Vehicle Parking

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Abstract—**The concept of smart cities have always been a dream for humanity. The growth of Internet of Things have given rise to new possibilities in terms of smart cities. Smart parking facilities and traffic management systems have always been at the core of constructing smart cities. In this paper the system involves using low-cost sensors, RFID tags, real-time data collection and mobile - phone - enabled automated payment systems that allow people to reserve parking very accurately and predict where they will likely find a spot, so this results in reduction in waiting time for parking, along with reduction in car emission and pollution, improved city visitor experience and need for man-power is reduced.**

I. INTRODUCTION

In the past few years, cities in all countries are experiencing a huge growth in the number of vehicles used for transportation. A general trend toward increased mobility and the concentration of shops and restaurants in malls have created parking problems and traffic jams. Frustration with parking is a major concern for all stakeholders involved. As the number of vehicles are increasing, the problems faced by manual parking management system are also increasing. Such problems can be eliminated to some extent by implementing an intelligent parking system where the entry and exit of cars is monitored and payment is made easy with sensor technology.

Vehicle parking management in organisations and malls often consists of many tasks like issuing tokens, noting the check-in and check-out time, calculating fare and finally collecting the amount. Parking Management Systems were developed to help people find parking spots quickly, thus reducing traffic jams and the resulting frustration, and enhancing the visitor's experience.

This system involves using low-cost sensors, RFID tags, real-time data collection, and mobile-phone-enabled automated payment systems that allow people to reserve parking very accurately predict where they will likely find a spot.It enables the user to find a vacant spot in parking area to park the vehicle, which includes online payment of parking fee in the most convenient way.The user has to download the application establish a bluetooth connection and park the

vehicle in the vacant spot shown in the application. Thus, this will help to reduce the load on the administrators, and the physical work reduces drastically as well as the labour work. With the increase in population, number of vehicles has increased and due to unmanaged parking it leads to many problems. Increase number of vehicles creates congestion, wastage of time, tension, stress, wastage of money, increased car emission and pollution, unhealthy city visitor experience.

II. CONTRIBUTION AND RELATED WORK

The related works that we have referred to develop the prototype are as follows.NoorHazrinHanyMohamadHanif, Mohd Hafiz Badiozaman, HanitaDau[1] has proposed an architecture that includes short message technique and it has enhanced security due to password requirement and System can be used and applied anywhere due to ease of usage, but Cost of implementation is high, GSM feature creates bottlenecks, and the microcontroller will have to take a lot of load which can crash the system.

Ashwin Sayeeraman, P.S.Ramesh [2] has propsed a model which includes parking lot vacancy module using ZigBee along with PIC. In the Security Feature: The exit password must be entered else the user is not allowed to get out of the parking bay as the barrier gate will not get open until correct exit password is entered, but the GSM and SMS module makes the system expensive and The SMS contains entry/exit password to the parking lot may not be received due to network congestion.

Harmeet Singh, ChetanAnand, Vinay Kumar, Ankit Sharmauses[3].Bluetooth access Technique, the system uses the user's Bluetooth for identification and registration. The system is transported to the parking location with the help of rack and pinion mechanism for linear motion. But it cannot be used in existing Parking system. The whole parking lot is to be designed with mechanical components such as rack and pinion mechanism.

DharmaReddy, A.RajeshwarRaoDr. Syed Musthakmhl;poinm-Ahmed.[4] proposed a model usingImage processing technique , By using image processing technique it identifies car only but if any object other than car is at parking

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slot it doesn't considered that slot is booked. ButHigh cost of implementation, User will have to inquire for every slot available and GSM system creates bottlenecks.

Hilal Al-Kharusi Ibrahim AlBahadly[5]proposed a system which captures and processes the rounded image drawn at parking lot and produces the information of the empty car parking spaces, camera is used as a sensor to take photos to show the occupancy of car parks and Single camera can detect the presence of many cars at once. But the weather conditions affect the System i.e. in terms of visibility,The camera should be in a position where it can see all the car parks and not be obstructed by any objects. And no guidance is provided to the parking lot.

M.M.Rashid, A.Musa, MataurRahmanv, N.Farahana[6] use Less interaction of humans and use magnetic card and its devices and identify the vehicles automatically by reading the license, but Different algorithm has to be applied for different type of number plates and no way a user can reserve a parking lot.

Geng, Christos, G. Cassandras [7]proposed a modelbased on Resource Allocation and Reservation. Reservation of the desired parking slot is available, Efficient resource allocation and management using MILP.But A parking spot is reserved by a driver, but it is occupied by a different driver. A parking spot is reserved by a driver, the driver parks his vehicle but forgets to confirm. The system requests confirmation and until the driver says YES.

Faheem[8]propsed a survey on parking system and the goal of the survey is to give the comprehensive guide to the state of the art in smart parking. The survey's gave interesting preliminary studies on some existing smart parking solutions.ButThe survey is only about preliminary studies.

Thanh Nam Pham1, Ming-Fong Tsai1, Duc Bing Nguyen1, Chyi-Ren Dow1 and Der-Jiunn Deng2[9] proposed a system which includes Better performance, Low Cost, includes resource allocation mechanics, Provides large scale parking system, but Car park should be registered in the smart parking system to provide service and the service cannot be provided if there is no smartphone.

Zhanlin.Ji, Ivan.Ganchev, Mairtin.O Droma,[10] proposed a model which includes cloud based technique is used when a user enters the university campus through one of its gates the car parking mobile app will send an automatic HTTP request through the gates access point towards a web server, and JSON response will be returned, however the three layers such as Application layer session layer and communication layer in implementing parking system makes this technique complex.

III. SYSTEM DESIGN

The Block diagram of this project is shown below:

Fig 1:Block Diagram of Smart Mobile Application for Vehicle Parking

a) Regulated power supply
b) IR Sensors (slot Detection)
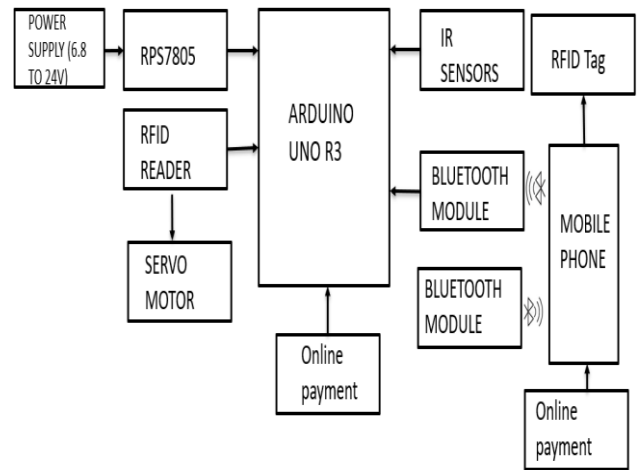
c) RFID (vehicle Detection)
d) Arduino Uno
e) ESP 8266 WIFI Module
f) Auto-park (Mobile application)

The transitions indicate the flow of the data between the Microcontroller and the rest of the components is shown in Fig.1. The user has to first register through the mobile application which indeed stores information onto the server. After registering into the parking system the user has the privilege to connect bluetooth of the device with the parking area device. Then user uses the application and checkout for a vacant parking slot available. The application is updated eachtime when the vehicle is detected in the parking area with the help of IR sensors. Vehicle identification is done with the help of RFID tags which are present on each vehicle. RFID readers are present on the parking area which captures the RFID information of each vehicles.

IV. HARDWARE CONNECTION

A. Microcontroller Arduino uno

It consists ofMicrocontroller shown in Fig.2ATmega32, consistsof Operating Voltage - 5V , Input Voltage (recommended) - 7-12V, Input Voltage (limits) - 6-20V Digital, I/O Pins - 14 (of which 6 provide PWM output), Analog Input Pins - 6, DC Current per I/O Pin - 40 mA, DC Current for 3.3V - Pin 50 mA.In the microcontroller, the analong pins A1, A2, A3, A4 are connected to IR Sensors and digital pins 7, -6, -5, 4, -3 are also connected to IR sensors as shown below. Both the analong pins and digital pins as mentioned are connected to IR sensor.
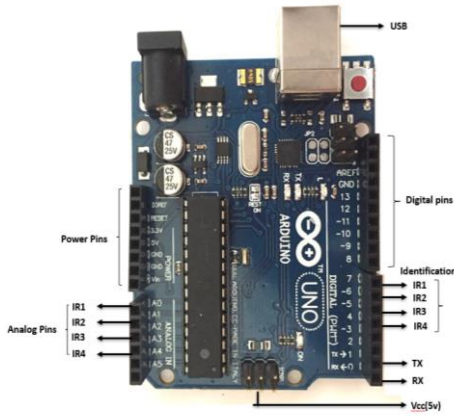
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Fig 2: Microcontroller arduino uno

B. IR sensor

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings is shown in Fig.3.Itdoesthisbyeitheremittingordetecting infrared radiation. Infraredsensors are also capable of measuring the heat being emitted by an object and detecting motion.It has 3v to 5v power supply Current 23mA to 43mA and Range is 2cm to 30cm.

Fig 3:IR sensor

C. RFID tag

It is a low cost, low power technology, it mainly consists of passive devices, named tags, which are able to transmit data when powered by the electromagnetic field generated by a reader. The RFID tag as shown in Fig.4 contains electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source.

Fig 4: RFID tag

D. RFID reader

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, in Fig .5which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. RFID and bluetooth works in serial communication. DC jack is pluggled in using a regulator 5v. The +5V of RFID reader is connected

to ardunio 5v. The ground is connected to ardunio ground also the TX of the RFID reader is connected to ardunio pin(2).
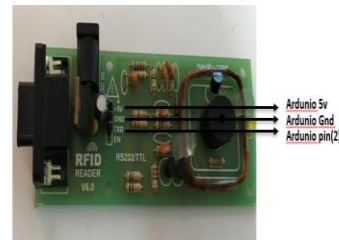

Fig 5: RFID reader

E. Bluetooth

Bluetooth is a wireless technology standard used for exchanging data between fixed and mobile devices over shortdistances using short-wavelength UHF radio waves is shown in Fig.6. The operating voltage of bluetooth is 3.3v, and current is 10A. In power pin sockets the pin number 3.3v goes to vcc and ground of microcontroller is connected to the ground. The pin number RX goes to the ardunio pin number 1 and pin number TX goes to the arduino pin number 2.
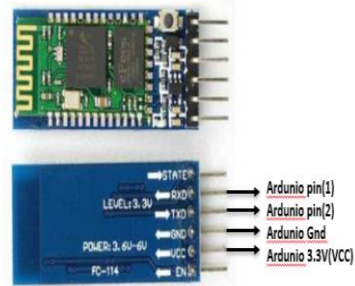

Fig 6:Bluetooth

F. RPS7805

A regulated power supply is very much essential for several electronic devices due to the semiconductor material employed in them have a fixed rate of current as well as voltage.The voltages provided by batteries are typically 1.2V, 3.7V, 9V and 12V.
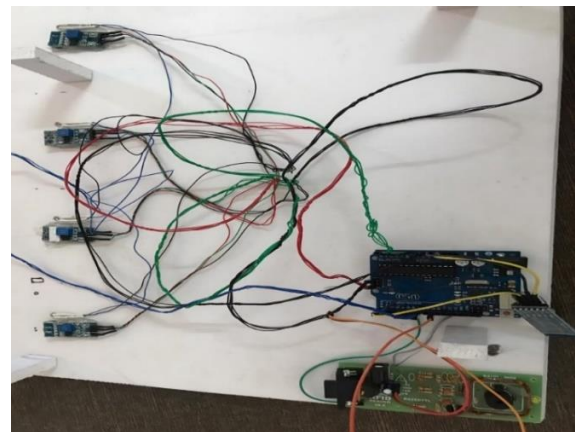

Fig7:Connection of each hardware devices

V.   IMPLEMENTATION

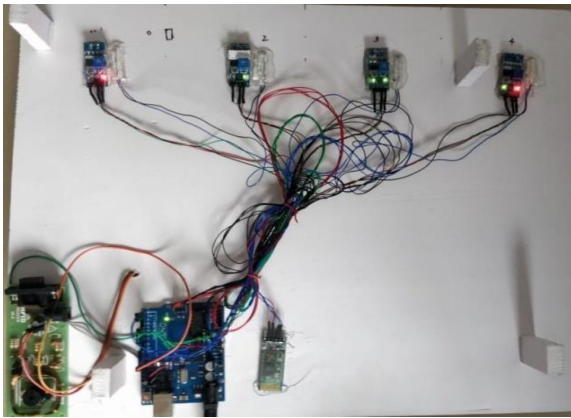Project implementation of hardware is shown below in Fig.8:

Fig.8: Implementation of hardware connection

The implementation of the project starts with hardware connection. The connection between Microprocessor and IR sensors, RFID reader, Bluetooth model and server motor will be established as shown in Fig.8

A. *Information of the Software tool used   how the application works*

The application developed is named as Auto-Park. It is developed using HTML and Java. The user has to install the application via online and fill up necessary information required for the application.

When a user enters parking area they have to establish Bluetooth connection between the mobile Bluetooth to the parking area Bluetooth as shown in Fig.9

Fig 9: Bluetooth connection between parking area and User application

The connection has been established between the Auto-park applications and parking area as shown in Fig.10 and the user can enter the parking lot by getting to know the available vacant slots in the application.
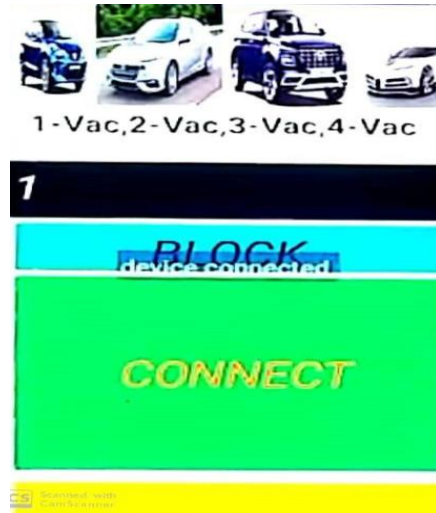

Fig 10: Device is connected to the parking area

Availability of vacant parking slots is been shown to the user in Fig.11 .They can park the vehicle in the selected vacant slot and do payment later on.
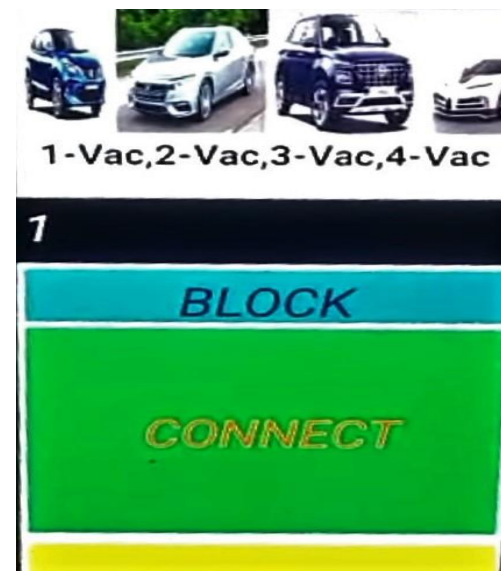

Fig 11: Availability of vacant slots is been shown to the user

VI.   ALGORITHM

Step1 : Install the Auto-Park application on your mobile.
Step2: Fill up the registration form
Step3: Connect your device Bluetooth with parking area Bluetooth device.
Step 4: With the help of the mobile app search for a vacant spot on and around your destination.
Step5: Park your vehicle in vacant parking slot.
Step6: Pay the parking charges from the Auto-Park online application.

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VII. RESULT

From this project an automated smart parking system is obtained which enables online payment of the parking fee. So the waiting time for parking is minimized, reduction in car emission and pollution, improved city visitor Experience also need for man-power is reduced.

VIII.   CONCLUSION

In this paper we address the issue of parking and present an Smart mobile Application for vehicle parking. The system that we propose provides real time information regarding availability of parking slots in a parking area along with that they can do online payment for parking charges.The effort made are intended to improve the parking facilities of a city and thereby aiming to enhance the quality of life of its people.

IX.   FUTURE SCOPE

The future of Smart parking market is expected to be significantly influenced by the arrival of automated vehicles. Project can be enhanced to track speed of the vehicles on theroad also by using GPS system we can better the parking system.

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