IOT based Smart Parking Management System

Harish Kumar
Department of Electronic and Communication
Amity University Haryana India

JagandeepKaur
Department of Electronic and Communication
Amity University Haryana India

Rajat Butola
Department of Electronic and Communication
Amity University Haryana India

Abstract*—With the increase in the population in urban areas, the vehicle availability and its usage has increased in recent years.This leads to the shortage of parking spaces drastically and to find parking space hasbecome a great challenge whichcannot be neglected. Since the parking spaces cannot be increased in accordance to the number of vehicles,hence, the proposed system is developed to solve this problem. It allows a user to pre-book a parking space online from anywhere and anytime.It also removes the problems such as no pre-booking of the parking spaces, improper authentication etc.of the existing systems. In this system, the data of the sensor node is transmitted using IOT. It uses C# website to pre-book the space and SQL database to store the data of sensor node for proper authentication.

***Keywords*—smart parking; Internet of Things; Structured query Language**

I. INTRODUCTION

. The automation technology made human life more simple and easy in all aspects. Automated systems are more efficient and intelligent as compared to manual systems and thus are preferred over the manual systems.With the increase in the numbers of internet users in recent years, it has become an integral part of our daily life. Connectivity is gone so far that the physical devices (sensors, processor etc.)can be connected to it and can be accessed from a remote location. IOT (Internet of things) can be defined as any physical device which could be connected to a network via wired or wireless connections. [1] These physical devices are known as a smart device, consists of smart machines that communicates with other machines, devices etc. The concept of a network of smart devices was coined by Levin Ashton in 1999[2]. Internet of things helped in solving the issues addressed above but it requires in-depth connectivity of the devices. A large population is migrating to the urban areas which result in increase in the traffic in the urban areas and people spend most of their time in searching for the free parking space

The smart parking is designed in such a manner that it can implemented in road side, covered parks and street side parks. Smart parking helps to pre-book the parking space of the nearest parking area with the help of website. Smart parking is amelioration technology that uses a computer to control the basic functionality. The data collected by the sensors is processed over the internet that is used to know the vacant slotandfor authentication etc. Smart parking project not just helps to reduce the problems of parking space availability but also enhances the security of the system by two step verifications. The project can be implemented in malls, hospitals and airports parking etc.

II.LITERATURE REVIEW

Basavaraju proposed parking system based on Raspberry pi-based parking sensor [1]. There are four components in Automatic Smart Parking system (Pi camera, Navigation System, Centralized server, Raspberry Pi). Pi camera continuously takes the images of the parking area. The captured images are transmitted via internet on the website. The information of vacant and booked spacesis updated on the website.The navigation system shows the nearby location of the parking spaces and the direction to the parking slot from the user's current location to the user. It also consists of a centralized server which accommodates the parking spaces information of covered parks, open parks and street parks. Microcontroller Raspberry pi controls all the hardware. [1]

Prof.S.S. Thoratet al.proposed IoT Based Smart Parking System Using RFID based on the RFID (Radio Frequency Identification) reader. RFID (Radio Frequency Identification) reader detects the presence of car parked in the parking area and IR(Infrared) sensors detects the presence of bikes in the parking area. The information of vacant and occupied slot collected by the RFID (Radio Frequency Identification) reader and IR(Infrared) sensor is transmitted over the internet and user can pay the charges online [3].

Prof. Suraj Damreet al. proposed Online Vehicle Parking Reservation System based on IOT and android applicationUser can book parking slot with the help of an android application. The application shows the booked space and free spaces in the parking area. The reserved parking slot can also be cancelled with the help of the android application. Bikescannotbe acknowledged with the RFID reader and IR (Infrared Sensor)[3].

Gaurav Surtaniet al. proposed Smart Parking System and It's Simulation based on IOT (Internet of things).The parking slot can be reserved online for a interval of time and a ticket will be generated at the time of the booking. The generated ticked has to be carried while going to the parking the car in the parking area. The parking charges can be paid online. It is more secure due to ticket acknowledgment [4].

HarviBaabuet al. proposed IoT based Smart Assist Parking System based on IOT andcloud. The parking slots can be reserved with the help of a mobile application. Mobile application is connected to cloud. The Cloud stores the data that refers to parking details, compute the data. Cloud provides some powerful computing tools to compute the data collected by the sensors. The user can reserve the parking slot for an interval of time. [5].

Nastaran Reza Nazar Zadeh et al. proposed Smart Urban Parking Detection System based on IOT and android application concept .The user can find the vacant parking on the real map using android app and can also book the parking space. The ultrasonic sensor is used to know the vacant slot, to send the data and gather user's information. Raspberry pi is used to control the hardware and the project is implemented on multilevel car parking and open car parking etc. [6]

Vrushali D. Ichakeet al proposed Smart Car Parking System Based on IoT Concept. The slots of parking can be booked either from a mobile or computer. Smart car parking uses the cloud infrastructure to compute and store the data. It shows the weather condition of the parking area e.g. temperature and intensity of light etc. For example, if the temperature is too high than the critical

temperature then it will give an indication by showing a red signal, if the light intensity is too low then it indicates the user to turn on the light. [7]

III. PROPOSED SYSTEM

Smart parking project can be implemented in open parks, covered parks and street side parks. Thephysical components used are Reed sensors, IR(Infrared) sensors, LCD (Liquid Crystal Display, ATMEGA 2560, LED (Light Emitting Diode) and Servo Motors. ATMEGA2560 controls all the hardware. Exchange of data between microcontroller and PC takes place through USB (Universal Serial Bus). Microsoft Visual studio (in front end) and MYSQL (back end) is usedas the user interface. The Website is designed in C# language and it is hosted on local system. Figure 1.1 and figure 1.2 shows the complete architecture of the project.

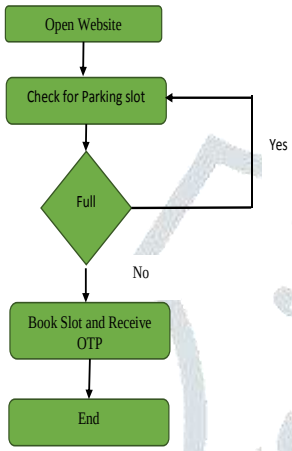

Figure 1.1 Online Booking

The user can book the parking slots online. If the parking space is free then the user can choose the slot and book by just providing email id and mobile number. As the user reserves a slot, a four-digit code will be sent to user's email id and it completes the online booking procedure. As the user enters the parking area, IR sensor detects the car and the user is asked to enter the mobile number. The data collected from keypad and IR sensors (mobile number) is verified with the database.If the code is valid then the barrier will open and the user can enter the parking area.

If the user has not done the booking yet but the parking space is free, the user simply can enter the parking slot by just entering the 10-digit mobile number and concurrently the mobile number entered by the user will be updated in database.

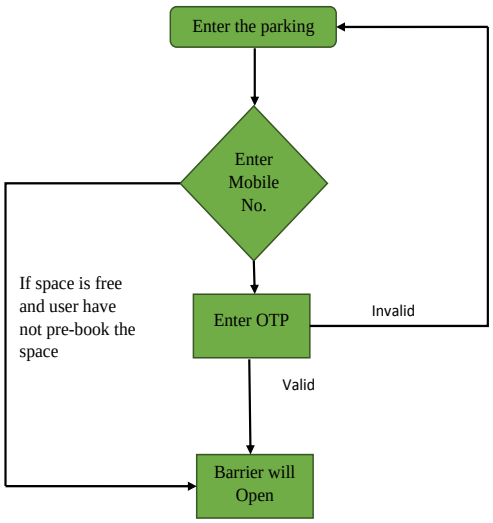

Figure 1.2 Smart Parking System

Hence the efficient utilization of parking space can be done and the security of the system also increases with the two-step verification. As soon as the user parks the car in the slot then the reed sensor will update the database.

A. Website

The website shows the parking slots both booked and vacant. Unchecked boxes show vacant spaces in the parking area.

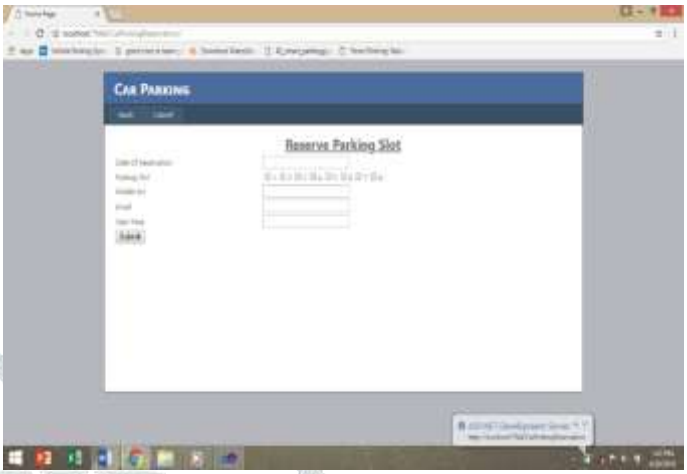

Figure 1.3 Website interface

The fields required to book the parking slot are Date of reservation, slot number to book, Mobile number, and Email-id.

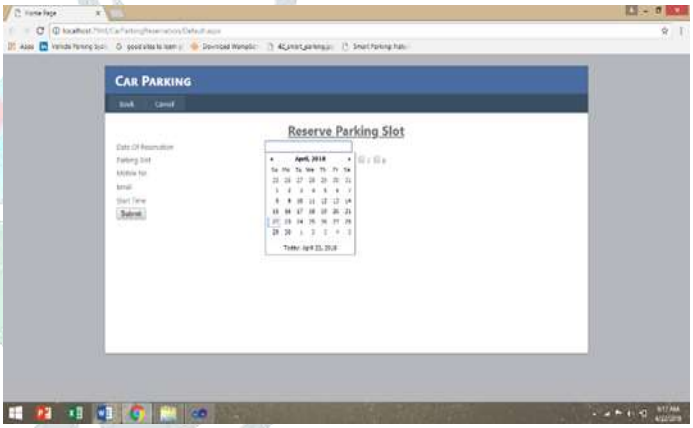

Figure 1.4 Selecting the date of Reservation

Calendar is provided on the website so user can book the parking space in advance. The local time and date of the system is sent through IOT with the help of USB to the controlling unit of the hardware i.e. ATMEGA 2560.

Fig 1.5 Checked Box shows Booked slot

The data of the booked slot is also passed to the ATMEGA 2560 using IOT through USB cable.

Fig 1.6 Complete Online booking process

After successful booking a four digit is sent to the user's email id.

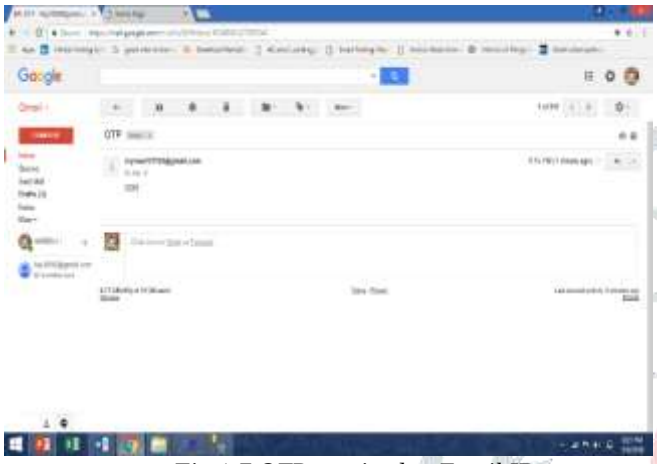

Fig 1.7 OTP received at Email ID

B. Sensor Node

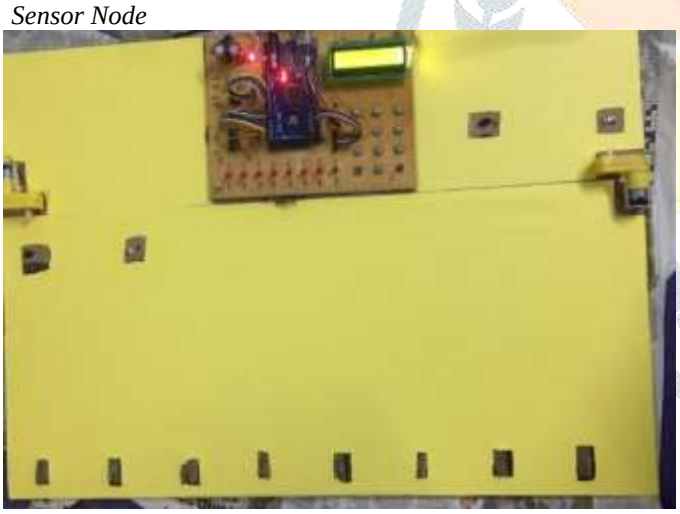

Fig 1.6 Complete Sensor node

Reed Sensors are used at the parking slot and IR (Infrared Sensors are used at entrance and exit gate. Reed sensors are also known as Reed switches. When Reed switches are brought into magnetic field, it experiences a magnetic force and behaves like a closed switch. As soon as the magnetic field is removed,Reed switch will not experience any magnetic force and will behave like an open switch.

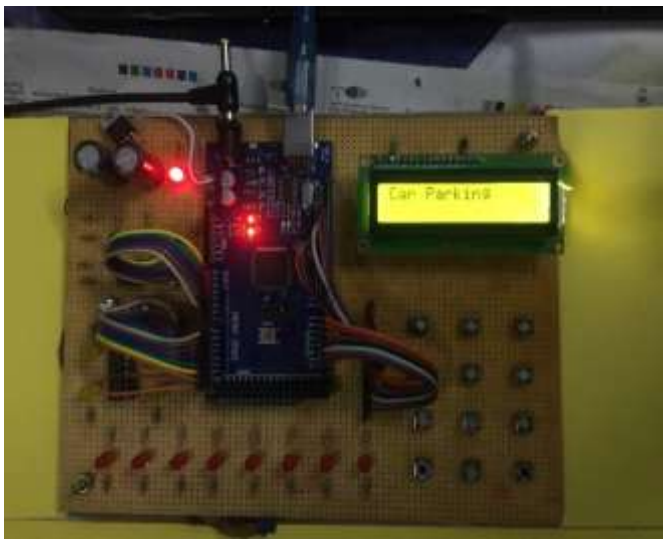

Fig 1.7 Controlling Unit

ATMEGA 2560 is used to control all the sensors and user is guided with the help of LCD (Liquid Crystal Display) by displaying concerned messages. Motors are used to open and close the barrier of gates.

IV. CONCLUTIONS

Smart parkingmollifiesthe limitations of the existing parking systems. It enables the user to pre-book the parking space to remove the conflicts in the parking area.Itenables us to utilize the parking spaces efficiently Smart parking is fully automated parking management system by opening and closing of the barrier without any manpowerand totally removes the human interface. Parking charges are also calculated automatically.Many problems associated with the existing system have been removed such as man power reduction and absence of two step verifications.

V. FUTURE WORK

Calculated parking charges can be paid online using gateways.Provision of sending OTP to the mobile number along with Email id Can be added. Wi-Fi module can be added for communication between PC and microcontroller.

REFERENCES

[1] Automatic Smart Parking System using Internet of Things (IOT) Published in: International Journal of Scientific and Research Publications, Volume 5, Issue 12, December 2015 629 ISSN 2250-3153

[2] Pallavi Sethi and Smruti R. SarangiAcademic Editor: Rajesh Khanna Internet of Things: Architectures, Protocols, and Applications **published in:** Journal of Electrical and Computer Engineering

[3] IoT Based Smart Parking System Using RFID **Published in:** International Journal of Computer Engineering In Research Trends Volume 4, Issue 1, January -2017, pp. 9-12 ISSN (O): 2349-7084

[4] Online Vehicle Parking Reservation System **Published in:** Imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-2, 2017 ISSN: 2454-1362

[5] Smart Parking System and It"s Simulation International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified Vol. 7, Issue 3, March 2018 ISSN (Online) 2278-1021

[6] IoT based Smart Parking System2016 International Conference on Internet of Things and Applications (IOTA) Maharashtra Institute of Technology, Pune, India 22 Jan - 24 Jan, 2016

[7] Nastaran Reza NazarZadeh,Jennifer C. Dela Cruz, Smart urban parking **Published in:** Control System, Computing and

Engineering (ICCSCE), 2016 6th IEEE International Conference, 2016

[8] Smart Car Parking System Based on IoT Concept Vrushali D. Ichake., Priya D. Shitole. and Mohsina Momin. Kanchan S. Thakare, Assistant Professor 2 published in: International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 www.ijesi.org ||Volume 5 Issue 3|| March 2016 || PP.48-54

[9] L. Mainetti,L.Palano,L. Patrono,M. L. Stefanizzi,R. Vergallo, Integration of RFID and WSN technologies in a Smart Parking System, Published in:Software,Telecommunications and Computer Networks (SoftCOM), 22nd International Conference,2014