

IOT Based Smart Parking using Fastag

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Abstract – In fast growing world the trends and technologies had been improved a lot. In that population also plays a important role, in this India is the second growing population in the world ranking status. In India one family requires two vehicles that had become a paramount of their life, here traffic congestion became major issue and so parking space are low and that has less requirement for the emptors. For this we consent an IoT that every work today had been done through internet. So that only solution is the smart parking based IoT. Smart parking is a good idea of how the Internet-of-Things (IoT) will be pervasively deployed in our daily living environments to different users, hence the proposed idea is to make the parking easier by detecting and monitoring, security, locate and reserve parking lot using IoT then display the result. An Arduino Mega is based on the automatic control of parking system by using codes. The main aim is to reduce the traffic congestion and to make the parking easier with low and efficient technology. In order to focus on the parking by reducing traffic congestion with less time requirement. The proposal of the smart parking system is that gain information of parking area and book the parking lot and tag by using webpage. In that particular parking area, the sensor detects the vehicles the information given to the main gate of the parking lot and then display in the LCD and tag is read by RFID Tag reader. So that particular car is checked and parked in the particular lot. The Node MCU is used for the purpose to build an IoT product and allows the simple and powerful program in WIFI module with the Arduino IDE software. The main advantage is that reduces time for parking the vehicle, cost efficient and security control.

Keywords – IoT (Internet of Things), IR sensors, Node MCU ESP8266, Arduino Mega, Cloud computing, RFID Tag and reader, Motor, LCD.

I. INTRODUCTION

Now-a-days car parking is so congested in cities, so we prefer to an easy method using the IoT based parking system. In this project car parking system is controlled by Arduino Mega and we use IR sensor to detect the slot is occupied or available then data are sent to microcontroller. The microcontroller sends data to cloud server (webpage). Before this project, we want to park the car in an any parking area is an issue in cities. Now this project is helpful to park the car in any area using this system. This allows users to check online from anywhere and availability of hassle-free parking. Thus, the system solves the parking issue for cities and gets user an efficient IoT based management system.

II. LITERATURE SURVEY

In this fast-growing economy, the number of vehicle users increases exponentially demanding more parking space. Pervasive presence of smart phone encourages users to prefer mobile application-based solutions. In recent times the concept of smart cities has gained grate popularity. Thanks to the evolution of Internet of things the idea of smart city now seems to be achievable. Consistent efforts are being made in the field of IoT in order to maximize the productivity and reliability of urban infrastructure.

Problems such as, traffic congestion, limited car parking facilities and road safety are being addressed by IoT. The growth of Internet of Things and Cloud technologies has 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, we address the issue of parking and present an IoT based Cloud integrated smart parking system. The system that we propose provides real time information regarding availability of parking slots in a parking area. Users from remote locations could book a parking slot for them by the use of our mobile application. The efforts made in this paper are indented to improve the parking facilities of a city and thereby aiming to enhance the quality of life of its people.

Cynthia J, Bharathi Priya C and P.A. Gopinath proposed that the an IoT based Smart parking system that integrates with mobile Application. Features are provided for reserving a parking space, authenticating a reserved user, identifying nearest free space depending on the size of the vehicle. Sensors are used to identify if a parking spot is free. Availability of a free slot with its location information is transmitted using WIFI module technology, microcontroller and wireless communication technology to the server and is retrieved though a mobile application. RFID tag attached to a vehicle is used to authenticate a user who reserves the parking slot on an hourly, daily, weekly or monthly basis.

Abhirup Khanna and Rishi Anand Proposed that an IoT based cloud integrated smart parking system. The proposed Smart Parking system consists of an on-site deployment of an IoT module that is used to monitor and signalize the state of availability of each single parking space. A mobile application is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly. The paper also describes a high-level view of the system architecture.

Archika Singh, Mumin Sajad Shawl, Shikha Bathla, Nidhi Gaur, Anupama Mehra proposed that parking has indirectly increased a lot of other issues; one of them being the quantity of automobiles on the road. The increased number of vehicles have resulted in heavy traffic and shortage of parking space which gives rise to illegal parking which itself is a threat to the security of cars. The main aim of this paper is to study different kinds of car parking systems and come up with an Intelligent Prepaid Car Parking system which addresses the problem of parking space, vacancy issues together with the safety of cars. It utilizes the perks of RFID (Radio Frequency Identification) using VHDL. It decreases manual work and makes the system more efficient. The design has been tested and simulated on Xilinx Vivado 15.4 Software tool. The utilization of various resources in the proposed design such as LUT (Look up Tables) is 0.07%, Flip flops is 0.03%, IO'S (Inputs/Outputs) is 14.5% and of buffers is 3.2%

III. EXISTING METHOD

Smart parking system that uses sensors in one way for parking either image processing technique that describes by taking a real pic of vehicles for processing and then scans with imaginary pic that stored in it then detects the vehicles in the parking lot by using cameras. Either lots for parking had been booked online through mobile applications then tag is shown through it in the parking area the RFID tag reader reads the tag and allocate space for parking. These methods are available in separate in the parking areas but they are performing the single functions only.

Disadvantages:

Single purpose functions are performed and the system is costly. It may be a bit confusing for the unfamiliar users.

IV. PROPOSED TECHNOLOGY

In proposed system we book a parking slot in parking areas with the use of internet. In case we forget to book the parking slot online, here the Arduino mega is used to control the components which are used for this proposed system like sensors, RFID Tag and reader, motor and LCD display, Node MCU. We can pay and book the slot by use of fastag. Get intimation in case of wrongly parked slot. To avoid wastage of time and easily payable of

parking charges. This uses single camera that covers whole area detects a less costly and parking lot space free to park the vehicle in correct way. The presented system has RFID which detects any objects that had been obstacles for parking the vehicle and that avoid it from that. The IOT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over an network without requiring human-to-human or human-to-computer interaction. Arduino IDE is software that uses embedded c language for programming purpose of Arduino Mega and Node MCU esp8266WIFI. If the parking lot is free nearby is booked and identified through webpage. We combined the all these components in single parking area with low cost management and we get better efficiency through this purpose. We created the webpage instead of mobile application. First, we need to program the controller and that is done by writing the appropriate program file in the ATMEGA328P FLASH memory. After dumping this program code, the controller executes this code and provides appropriate response.

1. Advantages:

- Less fuel is wasted while seeking for parking lot.
- Smart parking reducing stress while searching for a parking space.
- Smart parking takes away the unpredictability of finding a parking spot.
- Emissions are greatly brought down and reduced.
- There is high parking efficiency.

There is less chances for vehicle vandalism.

2. Block Diagram:

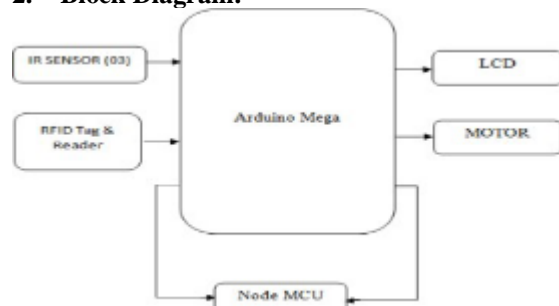


Fig1: Block diagram of smart parking

3. Hardware Description

Arduino Mega 2560

The microcontroller board like "Arduino Mega" depends on the ATmega2560 microcontroller. It includes digital input/output pins-54, where 16 pins are analog inputs, 14 are used like PWM outputs hardware serial ports (UARTs) – 4, a crystal oscillator -16 MHz, an ICSP header, a power jack, a USB connection, as well as an RST button. This board mainly includes everything which is essential for supporting the microcontroller. So, the

power supply of this board can be done by connecting it to a PC using a USB cable, or battery or an AC-DC adapter. This board can be protected from the unexpected electrical discharge by placing base plate. The SCL & SDA pins of Mega 2560 R3 board connects to beside the AREF pin. Additionally, there are two latest pins located near the RST pin. One pin is the IOREF that permit the shields to adjust the voltage offered from the Arduino board.

Another pin is not associated & it is kept for upcoming purposes. These boards work with every existing shield although can adjust to latest shields which utilize these extra pins.



Fig2: Arduino mega image

The pin configuration of this Arduino mega 2560 board is shown below. Every pin of this board comes by a particular function which is allied with it. All analog pins of this board can be used as digital I/O pins. By using this board, the Arduino mega projected can be designed. These boards offer flexible work memory space is the more & processing power that permits to work with different types of sensors without delay. When we compare with other types of Arduino boards, these boards are physically superior.

4. IR Sensor:

An infra red sensor is an electronic device, which emits in order to sense aspects of the surroundings. IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infra red radiation, rather than emitting it that is called a passive IR sensor.

5. Node MCU

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your microcontroller. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be

integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions.



Fig3: Nodemcu image

6. Motor

There are some special types of application of electrical motor where rotation of the motor is required for just a certain angle not continuously for long period of time. For these applications, some special type of motors is required with some special arrangement which makes the motor to rotate a certain angle for a given electrical input (signal). For this purpose servo motor comes into picture. This is normally a simple DC motor which is controlled for specific angular rotation with the help of additional servomechanism (a typical closed loop feedback control system). Now day's servo system has huge industrial applications. Servo motor applications are also commonly seen in remote controlled toy cars for controlling the direction of motion and it is also very commonly used as the motor which moves the tray of a CD or DVD player.

7. LCD

Dot matrix LCD modules is used for display the parameters and fault condition. 16 characters 2 lines display is used. It has controller which interface data's and LCD panel. Liquid crystal displays (LCD's) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them.

8. RFID Tag & Reader {Radio Frequency Identification}

Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal or person for the purpose of identification and tracking using radio waves.

Some tags can be read from several meters away and beyond the line of sight of the reader. An RFID tag is an object that can be applied to or incorporated into a product, animal or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

9. Software Used

The Arduino Integrated Development Environment - or Arduino Software (IDE)

- contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

10. Working:

Smart parking system is automated once the control is received from the web application or mobile application. Controlling is done by Arduino MegaP component and the controlling functions are performed by the Arduino IDE software by using the embedded c program. The main working is that user can book the parking lot and receive the tag through online then the person can locate the place through the online webpage and can be parked. Node MCU is used as WIFI module to the kit and to build as an IoT product it helps you to program the esp8266P WIFI with Arduino IDE software with simple and powerful embedded c program and controls the IR sensors and DC motor. In the parking area the motor is placed in main gate of parking area for opening and closing purpose then the RFID tag reader is placed in the main gate then the tag is read by RFID reader and checked that the same user who booked the lot for parking. In the parking lot the IR sensors are placed to detect the vehicle in that lot any another vehicle is parked then the signal is sent to main gate of parking area and is displayed through LCD. We prefer the NodeMCU for the purpose of webpage in our project. We can't able to link the web page in the Arduino Mega because it has no WIFI module and Arduino mega is used in smart parking for the purpose that provides information about the parking spaces and sends signal about parking availability with use of the IR sensor through webpage by NodeMCU.

V. CONCLUSION

By implementing this system there are various benefits will be provided for parking? By this system the economic, social and safety-based aspects of the society can be helped and it also helps in preserving the environment, fuel and time. The efforts made in the proposed system are to improve the parking facilities of city and they're by aiming to enhance the quality of life of its people.

Parking in populated areas has become challenged, so requirement of smart technologies in order to assist the

user in finding parking solutions to shorten the time necessary for parking. In this way we can decrease the traffic congestion, and to improve the everyday life of parking solutions.

VI. FUTURE SCOPE

The future the smart parking is to expect by the arrival of automatic vehicles (AVS). Using this system we can park up to 4 times as many cars in the same amount of space like traditional garage. Deduction of space in congested areas like metropolitan cities and populated areas can be improved by the same concept of parking system with horizontal alignment of car parking with the help of some mechanical instruments like motor conveyor sensors and weight cage machines by using the combination with IoT based parking.

REFERENCES

- [1]. Senthil.S, Suguna.M, Cynthia.J, (Jan2018)“Mapping The Vegetation Soil And Water Region Analysis Of Tuticorin District Using Landsat Images”, IJEST ISSN (2455-8494), Vol.03, No.01,.
- [2]. Bharathi Priya.C ,Dr..Siva Kumar.S,(2018) “ A survey on localization techniques in wireless sensor networks”, International Journal of Engineering & Technology, 7 (1.3) 125-1291.
- [3]. Supriya Shinde L 1, Ankita M Patial2, pSusmedha Chavan3,Sayali Deshmukh4, and Subodh Ingleshwar5 (2017) “IOT Based Parking System Using Google”, I- SMAC,pp.634-636.
- [4]. HemantChaudhary, PrateekBansal., Valarmathi.B(2017),” Advanced CAR Parking System using Arduino”, ICACSS, .
- [5]. Nastaran Reza NazarZadeh, Jennifer Dela.C,(2016),”Smart urban parking deducting system” ICSC, , pp-370-373.
- [6]. Ji. Z., Ganchev.I., O'droma, M., & Zhang, X. (2014, August). A cloudbased intelligent car parking services for smart cities. In General Assembly and Scientific Symposium (URSI GASS), URSI (pp. 1-4). IEEE.
- [7]. International Parking Institute, “2012 Emerging Trends in Parking”.
- [8]. Ballon, P., Glidden, J., Kranas, P., Menychtas, A., Ruston, S., & Van Der Graaf, S. (2011, October). Is there a Need for a Cloud Platform for European Smart Cities? In eChallenges e-2011 Conference Proceedings, IIMC International Information ManagementCorporation.
- [9]. FastPark System website, <http://www.fastprk.com>.
- [10].Rahul J. Kolekar and S.S.Gawade , (2014) Design and development of lift for an automatic car parking system, International Journal On Theoretical And Applied Research In Mechanical Engineering (IJTARME), ISSN (Print): 23193182, Volume -3, Issue-2, ,pp 55-59 [11]Kumar

- Gandhi.B (2016), "A Prototype for IoT based Car Parking Management system for Smart cities", Indian Journal of Science and Technology, vol. 9, no. 17,.
- [12]Bhende.M and Wagh.S,(2015), "Intelligent Car Park Management System using Wireless Sensor Network", International Journal of Computer Applications, vol. 122, no. 10, pp. 1-6. Safkhani.M ,Bagheri.N,Hosseinzadeh
- [11].M,EslamnezhadNamin.M and Rostampour.S,(2017) "On the security of an RFID-based parking lot management system", International Journal of Communication Systems, vol. 30, no. 15,.
- [12].Jae Kyu Suhr and Ho Gi Jung,(February 2014)"Sensor Fusion-Based Vacant Parking Slot Detection and Tracking," IEEE transactions on intelligent transportation systems, vol. 15, no. 1, pp. 21-36.
- [13].Arai.K, (2013)"Cheap and Effective System for Parking Avoidance of the Car Without Permission at Disabled Parking Permit Spaces", International Journal of Advanced Research in Artificial Intelligence, vol. 2, no. 10.
- [14].Nidhi Gaur; Ashutosh Gupta,; Anil Kumar, Sharma; Rahul, Malviya,(2014) "HDL implementation of prepaid electricity billing machine on FPGA" Confluence, The Next Generation Information Technology Summit (Confluence), 5th International Conference, pp 972-975
- [15].Wuhan Dongzhilin Technology Co., Ltd. (April 2013), "Urban Roadside Parking Management System", Technological Solution.
- [16].Kodialam.M and Nandagopal.T, (2006)"Fast and Reliable Estimation Schemes in RFID Systems," Proc. of ACM MOBICOM. Cha.J.R and Kim.J.H,(2006)
- [17]. "Dynamic Framed Slotted ALOHA Algorithms Using Fast Tag Estimation Method for RFID Systems," Proc. of IEEE CCNC,.
- [18].Caulfield.M and O'Mahoney.M,(mar-2007) "An examination of the public transport information requirements of users," IEEE Trans. on Intelligent Transportation Systems, vol. 8, no. 1, pp. 21–30.