

AUTOMATED MULTILEVEL CAR PARKING USING IOT

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Abstract – In our days, finding an available parking space can be considered as time and fuel consuming. Therefore, it may cause drivers to be frustrated which will lead to inappropriate parking and may lead to accident. This car parking system automatically transports car to different levels at a certain position through mechanized lifts by various sensors which will be based on Arduino uno. The EM-18 RFID Card reader will be used as the link between the Arduino and the e-payment process. This car parking reduces the amount of time a driver has to spend around the parking just to find an available spot. This system also reduces the traffic around the parking and also ensures safety in the parking area.

Key Words: RFID, Arduino, IR Sensor, GSM Module, Conveyor belt

1. INTRODUCTION

Car parking is still a growing problem with increasing vehicle sizes in the luxury segment. This is especially true when bearing in mind the confined parking spaces in parking lots and cities. The parking problem causes air pollution and traffic congestion. In today's scenario, parking space is hard to search in a day to day life for the people. According to the recent survey, there will be a rapid increase in the vehicle's population of over 1.6 billion around 2035. Around one million barrels of world's oil is being burnt daily. Thus, smart parking system is the key solution to reduce the wastage of the fuel. The smart parking can be a solution to minimize user's time and efficiency as well as the overall cost of the fuel burnt in search of the parking space

A multi-level car parking is essentially a building with number of floors or layers for the cars to be parked. The different levels are accessed through interior or exterior ramps. An automated car parking has mechanized lifts which carry the car to different levels to specified at allocated parking slots. These

car parks need less building volume and less ground space and thus saving the building cost. Car parking has significance both at the local and at the strategic level of planning. In order for parking policy decisions to be well founded, the analysis of parking and the effects of parking policies should be fully integrated with the other elements of the transport planning and modeling process.

Internet of thing (IoT) has the ability to transfer data through network without involving human interactions. IoT allows user to use affordable wireless technology and also helps the user to transfer the data into the cloud. IoT helps the user to maintain transparency. The idea of IoT started with the identity of things for connecting various devices. These devices can be controlled or monitored through computers over internet. IoT contains two prominent words "Internet" and "Things", where Internet is a vast network for connecting servers with devices. Internet enables the information to be sent, receive or even communicate with the devices. In this, the data is collected from the sensor and through analyzing and processing, the output is obtained.

This data is transmitted to the devices which in turn extracts the relevant information and sends it to the Arduino device which gives the command instruction for the data to the particular devices simultaneously. Arduino sends the signal to the servo motor along with GSM module which further gives instructions and notification to the user. When the user enters in the parking area, RFID card allotted to the registered user is scanned by the reader module thus ensuring the security of the user identity. This enables the user to get the information of the available parking space as well as SMS notification to the registered user's mobile number.

2. RELATED WORK

Various methods are prevalent for development of autonomous or intelligent parking systems. Study of these systems shows that these require a little or more human intervention for the functioning. This paper proposes efficient way to unfold the issue of parking availability in the real time scenario and to reduce the time consumption. In this, the data is sent locally with devices which filters the data. This signal is transmitted to the cloud for the evaluation process which uses machine learning algorithms [1]. This paper uses mobile phone application that connects API. This paper doesn't provide the reservation facility for the car parking. This author has divided detector system and vehicle sensors into two main categories as intrusive sensors and non-intrusive sensors. Intrusive sensors are installed in holes on the road surface by tunneling under the road. Non-intrusive sensors do not affect the road surface and it can be easily installed and maintained. Smart parking system helps us to resolve the grounding problems of the traffic congestion and it also reduces the emission from a car [2]. The sensors used in IoT based smart parking system stores and accesses data from remote locations and with the help of cloud, these factors give rise to cloud of things (COT). The nodes could be monitored and controlled from any location the system that we propose provides information regarding the availability of the parking slots with the help of the mobile application the users from the remote location can book the parking slots [3]. An algorithm is used to increase efficiency of cloud-based parking system and network architecture technology is used. This algorithm is used to find the lowest cost parking space. By considering the number of parking space available and also the distance of the parking space from the user, the user can directly access the cloud-based server and find the information on the parking space. The user can also install an application in their mobile phones to access this information. With the help of this algorithm, waiting time of the user to find a parking space can be minimized. Security aspects are not included in this paper [4]. A wireless sensor node along with smart phone application is used to find the parking space. Wireless technology is used in this system has high accuracy and efficiency. In this system, onboard units are used to communicate with other vehicles. The user parks his vehicle in any one of the several bays available a mechanical lift lifts the vehicle out. The vehicle can be retrieved by using a

ticket key and an id which is given to the user. The user need not carry any paper ticket since an RFID card is given to the user. The technology used here is economical. Security features must be improved to protect the user's privacy [5].

3. PROPOSED WORK

The aim of this project is to design an automatic multilevel car parking system. The system has mechanized lifts that carry the car to different levels at an allocated parking slot.

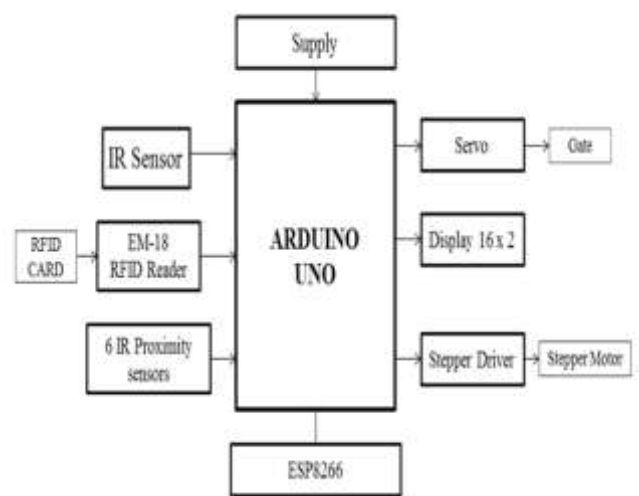


Fig-1: Overall Block diagram

The three main hardware components used are Arduino Uno, RFID card reader and IR sensors. As the car enters the parking slot, reader module scans the registered user's RFID tag. The data is sent to the Arduino for checking the availability of parking slots. IR sensors placed in the parking slots sends the signal on the availability of parking slots. The user is notified on the display about the status of the parking area. If parking slot is available, user gets notification on the basis of the availability via SMS through GSM module and the servomotor helps to open the gate. This code will be saved in the system against a slot which will be sent to the car parking tray. The user needs to park the car in the car parking tray. The car parking tray work with the help of stepper motor that goes up to the allocated car slot and with the help of conveyor parks the car and then comes down to park the next car. For parking out the user will have to scan RFID card on the reader module and the system gives signal to the car parking tray to park

out the car. The car will park out on the same way it is parked in.

4. HARDWARE DESCRIPTION

The hardware consists of components such as Arduino Uno, ESP8266 Wifi Module, GSM module, RFID Card reader, Stepper Motor, Conveyor.

4.1 Arduino Uno

It is a compact board which can be used in various devices and various field. It has overall 22 input/output pins out of which 14 pins are digital pins. It has a flash memory of about 32kb. These pins can control the operations of digital pins as well as analog pins. This module is a breadboard-friendly board which can be easily used anywhere.



Fig-2: Arduino Uno

4.2 ESP8266 WIFI Module

It is used to send data from embedded system to the internet using URL by HTTP POST method using TCP/IP protocol. It is developed by Espressif Systems. It is a 32bit microcontroller with 80kb user data. It contains 16 general purpose input/output pins.



Fig-3: WiFi Module

4.3 IR Sensor

An infrared sensor is basically an electronic device which is used to detect the presence of objects. Infrared light emitted by this device. If this device does not detect any IR light reflected back that means there is no object present. If the light is detected by the sensor there is an object present.



Fig-4: IR Sensor

4.4 Alphanumeric LCD Display (16 X 2)

The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.



Fig-5: Alphanumerical Display

4.5 RFID Card

RFID tags are made up of integrated circuit (IC), an antenna, and a substrate. It is an identification badge or credit card that transfers its contents about an object to the reader module. RFID tag transfers data about an object through radio waves. When RFID tags are attached to devices they can also be used for tracking.



Fig-6: RFID Card

4.6 READER Module

This module is a device which scans and gathers the information from the RFID Card. This card can be used to track objects. As the car enters the parking area, the user scans the RFID card and all the information stored in the card is transferred to the Arduino through this module.

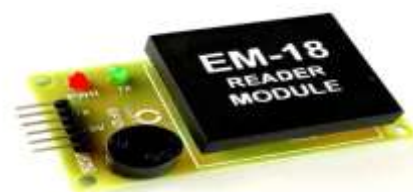


Fig-7: Reader Module

4.7 GSM Module

The GSM module is a circuit which is used to setup communication between mobile phones and microcontroller. It is used to send SMS, MMS and voice messages through mobile network. GPRS extension in GSM allows high data transmission. GSM uses time division multiple access approach for transmission.



Fig-8: GSM Module

4.8 Conveyor

The integrated mini conveyor is very compact and particularly suitable for transfers of light and small products. It is equipped with a DC motor with servo.



Fig-9: Mini Conveyor

4.9 Servo Motor

It is a rotator device that allows the control of angular as well as linear motion. A servo motor is used for the opening and closing of the gate. Servo driver transmits electrical signals to the servo motor for producing motion.



Fig-10: Servo Motor

4.10 Stepper Motor

The stepper motors move in precisely repeatable steps, hence they are the motors of choice for the machines requiring precise position control. The motor's position can be commanded to move or hold at one position with the help of stepper motor drivers.



Fig-11: Stepper Motor

4.11 Stepper Driver

A4988 micro stepping bipolar stepper motor driver features adjustable current limiting, over current and over-temperature protection and five different micro step solutions (down to 1/16 step). It operates from 8V to 35V and can deliver up to approximately 1 A per phase without a heat sink.



Fig-12: Stepper Driver

5. IMPLEMENTATION

This section contains the implementation of the proposed system. Every user who enters the parking area has a RFID card which contains the details of the user. When the RFID card is scanned by the reader module, the details of the user are transferred into the module. Now the IR sensor checks whether the parking space are free or not. A message is sent to the user with the help of a GSM module depending upon the availability and unavailability of parking space. The WIFI module supports the system by storing all the data in the cloud. It connects the devices with the cloud server.

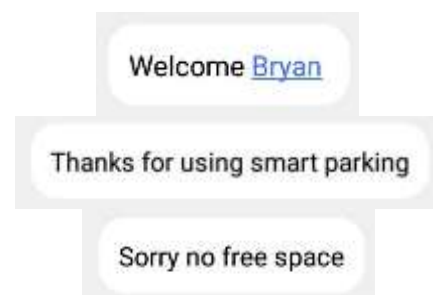


Fig-13: Message Received by User

Here, the user scans the RFID card provided. If space is available, the user receives a message "Welcome

username”, the barrier gate will open and the user can park the car in the parking tray. With the help of stepper motor and conveyor car is parked to the slot. Before exiting the parking space, the user again has to scan the RFID and a message will be received by the user “Thanks for using smart parking”. The database about the user’s activity in the parking space will be stored in cloud database.



Fig-14: Model

The user will know that a particular space is available with the help of the cloud status. When the car is parked, the IR sensor detects the presence of an object and updates the cloud status from 0 to 1 and when the car leaves, the cloud status is updated from 1 to 0. The cloud status is updated every 2 minutes.

6. RESULT

The demand of smart parking system is increasing significantly. This allows user to involve real time access of the availability of the parking space. The existing system in today’s world doesn’t contain the facilities of parking reservation and parking slot availability checker. The existing system was vision-based monitoring system which estimates the number of the parking slots available in the area by counting the number of incoming and outgoing cars which consumes lot of time and effort [6]. The next existing system was sensor-based system which uses ultrasonic sound waves for detecting the presence of vehicles. The result of this system is to make the

parking area easily accessible to everyone as well as reducing time and cost for the user. It also helps to reduce the area required for car parking and the overall fuel energy consumed by the vehicle in search for a car parking slot is considerably reduced.

7. CONCLUSIONS

This project can be introduced and it will be very beneficial for our densely populated cities. The main benefits are time and fuel saving. It can also provide sustainable parking management in an eco-friendly manner. As the green house gas emission will be less in amount, the environment and surroundings will be clean. There is less maintenance cost for this system so it helps the property developer in cost saving. It provides security to the parking ground. The system provides a real time process and information of the parking slots. This system enhances the performance of saving users time to locate an appropriate parking space. This system reduces the hassle in parking grounds and traffic jam. It will benefit the property developer to increase their revenue which will add to the government tax revenue. It will encourage Automation Engineering in our country which will make advancement in increasing usage of technology. Therefore, we should introduce this system and enjoy the benefits. In the future the users would be able to book a parking space from a remote location by GPS reservation facilities and a license plate scanner can also be included for identification.

REFERENCES

1. Wael Alsafery, B.A (2018). Smart car parkingsystem solution for the Internet of things in smart cities. IEEE, 5.
2. Khaoula Hassoune, (2016) Smart Parking Systems: A survey, IEEE, 6.
3. Abhirup Khanna, R. A (2016) IoT Smart parking system,International Conference on Internet of Things and Applications IOTA
4. Deng, D(2015). A Cloud based smartparking based on Internet of Things Technologies. IEEE, 11.
5. O.Orrie,B.S.(2015). A wireless SmartParking system. IECON (P.5). Yokohama: IEEE
6. Mohit Patil, R. S (2014). Smart Parking system based on Reservation, International Journal of Scientific Engineering and Research (IJSER)

7. Rachapol Lookmuang, K. N. (2018). Smart Parking Using IoT Technology. IEEE, 6.
8. Sadhukhan, P.(2017). An IoT-based Parking System for Smart Cities. Research gate, 6.
9. J. Cynthia, C. B. (2018). IOT based Smart Parking Management System. International Journal of Recent Technology and Engineering (IJRTE), 6.
10. Ahteshamul Huq Osmani, A. G. (2016). Research paper on Smart City Parking System. IJARIE, 3
11. Asghar Ali Shah, G. M. (2019). Video Stitching with Localized 360o Model for Intelligent Car Parking Monitoring and Assistance System. IJCSNS International Journal of Computer Science and Network Security, 6.
12. Bachhav, J. D. (2017). Smart Car Parking System. International Research Journal of Engineering and Technology (IRJET), 3.
13. T. Bhanusri, K. R. (2016). Advanced Car Parking System with GSM Supported Slot Messenger. IOSR Journal of Electronics and Communication Engineering, 6.
14. Study on Automated Car parking system based on Microcontroller, Tianjin University of Technology, Tianjin, Volume: 03 Issue: 04 | January-2014
15. Automatic Smart Car Parking System, Nutan Maharashtra Institute of Technology, Pune, Volume: 03 Issue: 03 | March-2016
16. Introduction to Vertical Multistage Car Parking System, Priyandarshini Bhagwati College of Engineering, Nagpur, Volume: 03 Issue: 04 | Apr-2016



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