INTELLIGENT VEHICLE PARKING MANAGEMENT: RFID AND IOT INTEGRATION FOR AUTOMATED ACCESS AND BILLING

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ABSTRACT

In many cities and shopping centers, parking is a big problem. An intelligent and effective method of automating the parking system's management that uses internet of things technology to assign a parking place efficiently. We created a smart parking system project in order to prevent that issue. The user can determine the availability of a slot by using an infrared sensor to locate the parking space that is open. The project's goal is to create a sophisticated, intelligent parking system. Vehicle presence is detected in this system using infrared obstacle sensors, which are linked to an Arduino microcontroller. The three parking spots are detected by all three IR sensors, and the appropriate data is posted on the LCD and IOT app. Using RFID, this system provides security for vehicle entry. If the car is legitimate, then proceed with paying the parking money. Once that is done, the servo motor will open, allowing the car to enter. The car will be parked in any available space after it has been admitted. The information about parking spots will be posted to the IOT server. In order to show the available slots, the microcontroller communicates with the LCD modules the status of each IR sensor. The user can readily retrieve the data when the microcontroller scans the data shown over the LCD and IOT. in addition to using the Internet of Things, such as updating the website with the parking slot's status. It allows the user to view the available parking spaces at the parking location. This is accomplished by transmitting sensor data via the WiFi module (ESP8266). We can send a request to locate available parking slots over GSM, and it provides transaction details in the form of SMS. The suggested solution will shorten wait times at the parking lot and enable us to make efficient use of the space. The embedded "C" programming language was used to implement the suggested system.

Keywords: RFID, Smart Vehicle Parking, Automated Billing, Iot, IR Sensor, Arduino Microcontroller, LCD Display, Servo Motor, Security, Internet Of Things, Wifi Module (ESP8266), GSM

1. INTRODUCTION

Car parking is a major issue in modern congested cities of today. There simply are too many vehicles on the road and not enough parking space. This has led to the need for efficient parking management systems. Thus we demonstrate the use of IOT based parking management system that allows for efficient parking space utilization using IOT technology. To demonstrate the concept we use IR sensors for sensing parking slot occupancy along with a dc motors to simulate as gate opener motors. We now use a wifi modem for internet connectivity and an AVR microcontroller for operating the system. We use IOTGecko for online connectivity and IOT management GUI design. The system detects if parking slots are occupied using IR sensors. Also it uses IR technology to sense if a vehicle has arrived on gate for automated gate opening. The system reads the number of parking slots available and updates data with the cloud server to allow for checking parking slot availability online. This allows users to check for available parking spaces online from anywhere and avail hassle free parking. Thus the system solves the parking issue for cities and get users an efficient IOT based parking management system. In recent times the concept of smart cities have 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. In this paper, we present 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. Towards the end, the paper discusses the working of the system in form of a use case that proves the correctness of the proposed model. The concept of Internet of Things (IoT) started with things with identity communication devices. The devices could be tracked, controlled or monitored using remote computers connected through Internet. IoT extends the use of Internet providing the communication, and thus inter-network of the devices and physical objects, or 'Things'

2. LITERATURE SURVEY

[1]The sensors used in IoT based smart parking systemstores and accesses data from remote locations with the help of the cloud these factors give raise 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. [2] 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. Considering the number of parking space available and also considering 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 minimised. Security aspects are not included in this paper. [3] A wireless sensor node along with smart phone application is being used to find the parking space.Since, wireless technology is used here the 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. A ticket key and id are given to the user and it is only known to the user which is used to retrieve the vehicle. The user need not carry any paper ticket since anRfid card is given to the user. The technology used here is economical. Security features must be improved to protect the user's privacy. [4] The author of smart parking system the survey has divided detector system and vehicle sensors into two math categories as intrusive sensors and non - intrusive sensors. Intrusive sensors are installed in holes on the road surface by tunnelling under the road. Non-intrusive sensors do not affect the surface of the road 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. [5] A 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 over the cloud for the process as well as for evaluation which uses machine learning algorithms. This paper uses mobile phone application that connects the user with the real time traffic status via Google API. Thus ,avoiding traffic congestion. This paper does not provide the reservation facility for the car parking. [6] Smart parking using IoT technology helps to designs and develops a real smart parking system which provides information for vacant spaces and also helps the user to locate the nearest availability. This paper uses a computer vision to detect vehicle number plate in order to enhance the security. The user can pay for the parking space prior to the entry of the car through mobile payment. Thus, insuring the reservation of the parking. The user is notified about the parking location, number of slots available and all other relevant information. The paper uses efficient algorithms and techniques for extracting license plate text. An algorithm operates on the ultrasonic sensor detection of the vehicle entering into the parking slot and calculates the minimum cost for the user. [7] Smart parking system based on reservation allows the reservation of a vacant space which involves smart parking system based on reservation (SPSR).This consists of host parking database management which collects and stores data about the driver's identity and parking location. When the parking reservation time is about to expire a

notification will be sent to the user through the web service that has been provided to the user by the admin. The main drawback is that some other user can occupy a reserved parking space to avoid this QR scanners are used to identify the user.

3. PROPOSED SYSTEM

The proposed system is used to indicate the user about the vacancy of the parking slots. A user can choose the parking slot in advance, instead of waiting in area of the parking, where the parking availability is shown through user's smart phones. RFID reader and card will provide the security of the parking system. IR Sensors will be attached in each slot for detecting the vacancy. The signal from the sensors captured by Arduino and this signal is then converted from electrical signal into another form to detect presence of vehicle in terms of the amount of light reflected back from the obstacle such as wall of the parking lot. The output from Arduino depends on the measurement of amount of light and based on that, slot's allocation is done. On the other hand, the output from Arduino is changed into text format and sent to the smart phones through a developed Android IOT application.
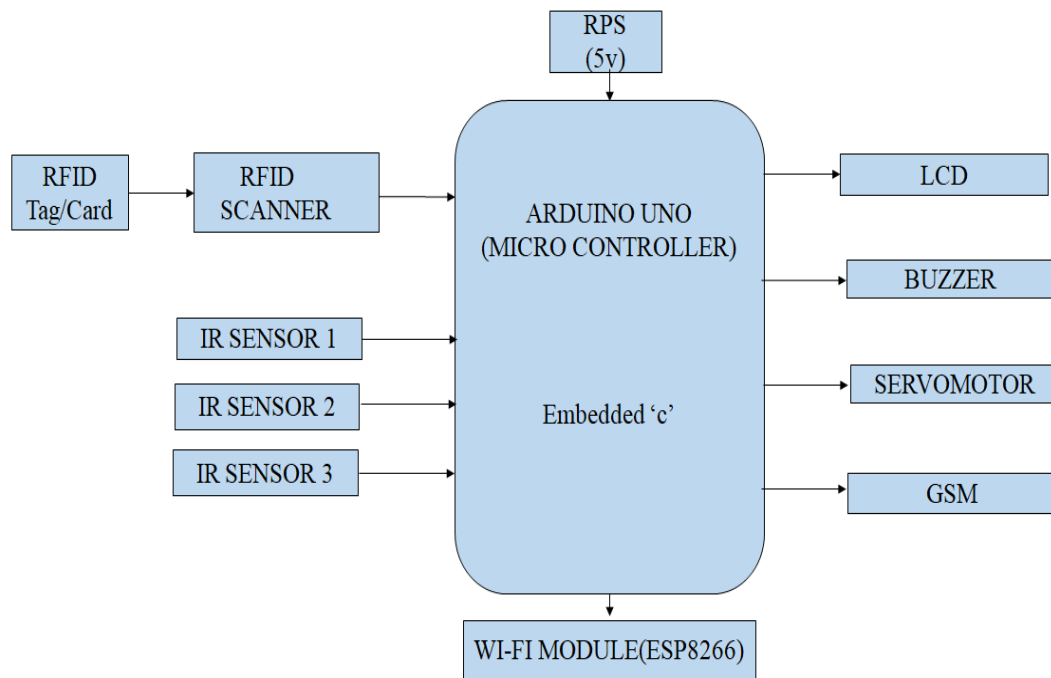

Fig. 1: Block Diagram of Proposed System.

Arduino Uno Wi-Fi board is integrated with Wi-Fi module which will be used in this project. This board is based on integrated ESP8266 Wi-Fi Module and ATmega328P. The Wi-Fi module has TCP/IP Protocol stack which gives direct access to the Wi-Fi network. This board is programmed by using Arduino IDE software. This board is ideal as it can run both in online and offline mode.

This system having security for accessing vehicle using RFID. If the vehicle is valid then allow for payment of the parking fee after payment done servo motor will open and vehicle get in. after vehicle get in it will be place in any of the parking slots. That parking slots information will post into IOT sever. Microcontroller sends the status of all IR sensors to LCD modules to display the available slots. GSM module will send the existing balance when the user accessed into parking slot. We can get the status of the slots by keeping the GSM SMS alerts. Microcontroller reads the data display over LCD, GSM and IOT then user can easily access the data.

Schematic Diagram:
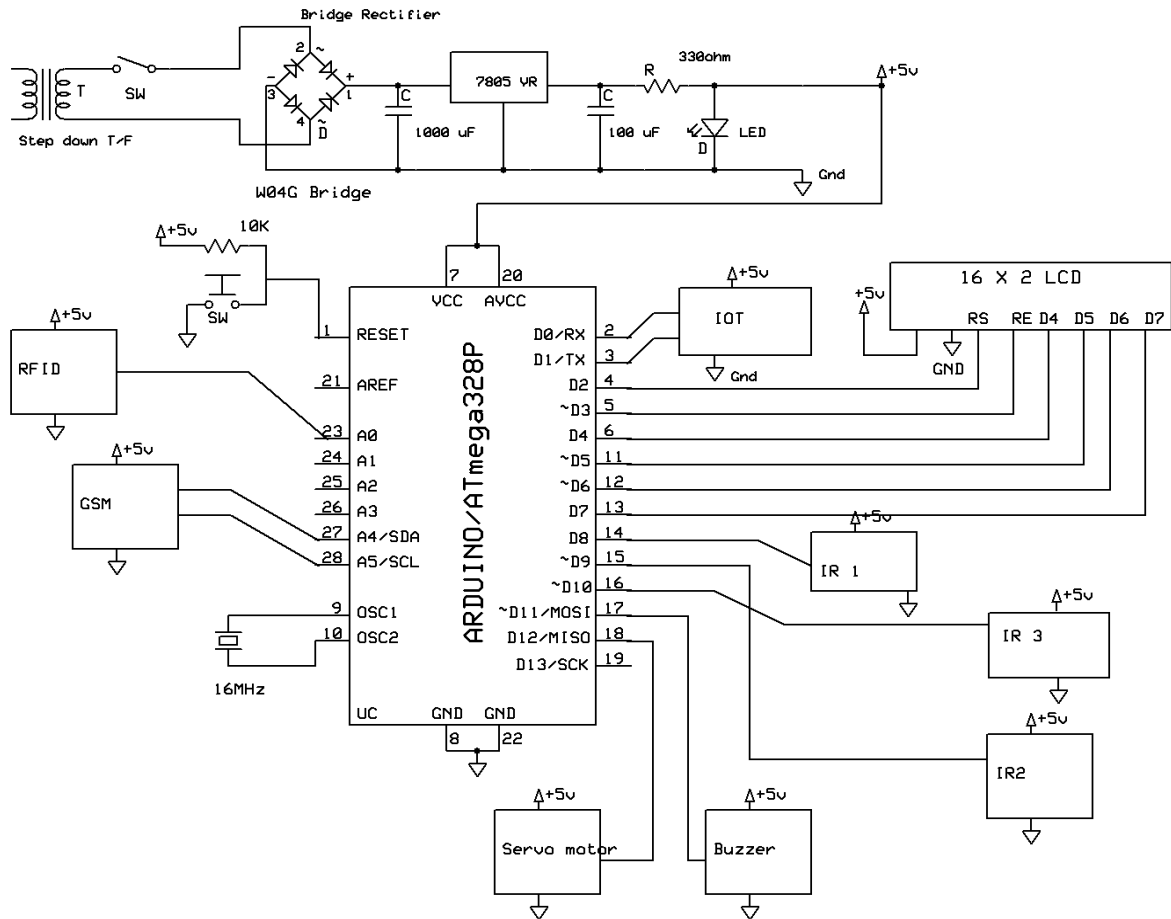
This is the pin diagram where all the hardware components are been connected components.this ARDUINO microcontroller having 28 pins. In which 14 GPIO pins as digital pins and 6 GPIO pins. 16MHz crystal oscillator connected internally. The step down transformer ,Bridge rectifier capacitor with 1000f Resisters and led are connected in Regulated power supply which provide the 5v to th e Arduino and all input/output modules.

Schematic

16*2 LCD Monitor has connected with the Digital pins 2, 3, 4,5,6,7.

WIFI has connected to Digital Pins D0,D1 internal Transmitter and receiver pins.

3IR sensors connected to 8,9,10 pins of the Arduino micro controller.

RFID connected to digital pin A0

Servo motor connected to digital pin 12

Buzzer alarm connected to digital pin 11
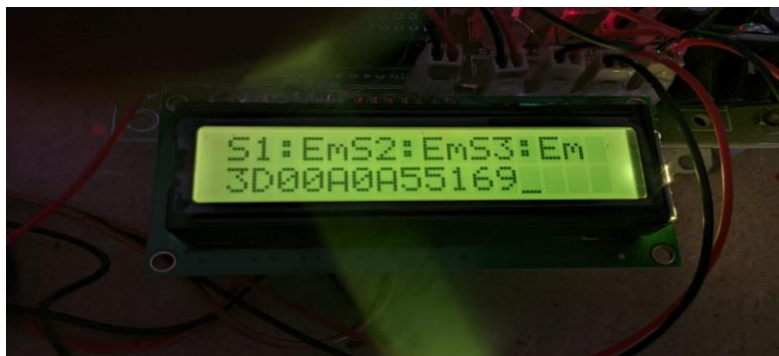
GSM connected to A4 and A5.

4. RESULTS

This is about the project named as IOT based Smart vehicle parking and automatic billing system.

Now send SMS to registered mobile number placed in GSM after checking the signal strength of the sim.
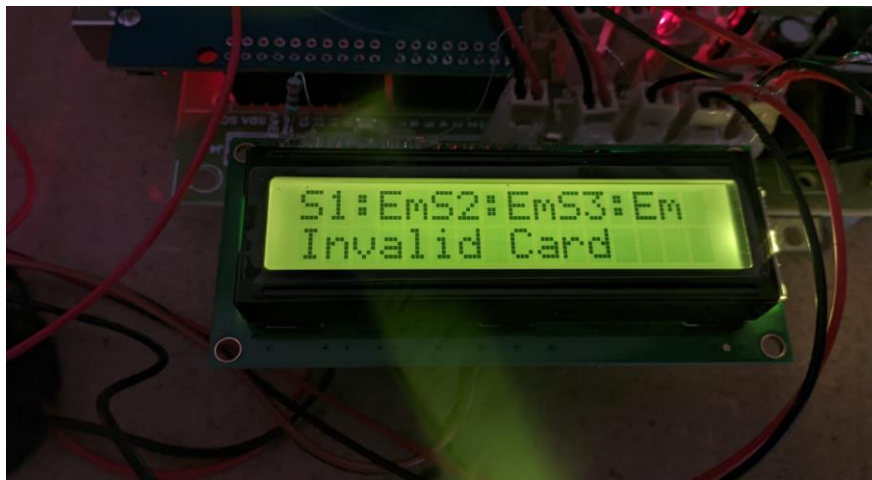

Then the LCD will display about the empty slots in each parking area in which car needs to be parked.

Now a car is parked in a parking slot and card number is 3D00A055169.

Then 10 rupees is debited for registered mobile number's wallet for each when the car is parked.

When the card is invalid, it means mobile number is not registered and it has to be registered to enter into the parking slot and to get the gates opened to enter.

5. CONCLUSION

We designed and implemented RFID IOT based smart secured vehicle parking system successfully. The project aims at designing an advanced smart parking system. In this system we use IR obstacle sensors as vehicle presence detection and these sensors are connected to Arduino Microcontroller. All 3 IR sensors detect the 3 parking positions corresponding data will be post on LCD and IOT app. This system having security for accessing vehicle using RFID. If the vehicle is valid then allow for payment of the parking fee after payment done servo motor will open and vehicle get in. after vehicle get in it will be place in any of the parking slots. GSM module used send the balanced amount to authorized person and get the slots availability wirelessly from anywhere using GSM module. That parking slots information will post into IOT sever. Microcontroller sends the status of all IR sensors to LCD modules to display the available slots. Microcontroller reads the data display over LCD and IOT then user can easily access the data.

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