

Vehicle Parking System Automation with Ensured Reservation Area

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Abstract—Traffic congestion has been a part of everyday life throughout the modern society, according to the rapid increase in population. Also as result, our developed system help to promote proper control of the vehicle within private spaces such as education institutions, offices, and other spaces in order to avoid illegal vehicle parking. Our primary task is to find and fine unauthorized individuals whom parked in designated areas. It is used to stop people parking illegally, trying to bribe and intimidating staff, and so on. In this case, we had an RFID tag that contains such information. If a individual id does not match, then warning information is typically sent to the holder via Notification system. Detection of approved and non-permitted vehicles also at main entrance, as well as recognition of unauthorized parking vehicles as in control zone, are among the features. This could be used to create a compromise for towns as well as private vehicle parking operators.

Index Terms— RFID, GSM, SMS, Cloud System, Vehicle Parking, Unauthorized vehicle.

I. INTRODUCTION

Our civilization has been transformed by new technology. We are capable of resolving any problem that arises. The use of scientific understanding in parking lot management is needed. As a consequence, for quite some time, the idea of Automated Vehicle Parking System Automation with Ensured Reservation Area seems to have been a requirement. It maintains the parking area's protection by banning unauthorized vehicles from entering and therefore only allowing approved vehicles to park there. Previously, a significant number of people were sent to search for illegal parking.

This system has a lot of overhead expenses in terms of personnel, fuel, as well as other physical security. As a result, we implement a device that detects and alerts illegal parking automatically. Every vehicle is equipped via an RFID transmitter as component of the system. Any place wherever parking is prohibited has an RFID receiver circuit installed. Whenever a vehicle is parked in such a prohibited-parking zone, the RFID transmitter directly interacts with the receiver. It will immediately warn the authority by reading the transmitting id and sending an SMS to its car owner, requesting that he leave the area.

II. LITERATURE SURVEY

The demand for car parking spaces in cities is growing by the day. There is a greater need than ever before to

find a secured parking space and reserve it before arriving. Numerous researches have been done in this area. There have been some books and articles discovered that addressed systems in a similar way to the proposed method.

A two-module system is created in a study [1]. One module displays a layout animated of the parking lot's current status, while the other allows users to reserve a parking area via SMS. Other studies [2] - [4] have used LED lights to make parking lot condition visible. For the LED to lights, they used Infrared sensors modules [4]. Wireless sensor with advanced features such as parking spaces monitoring, computerized guidance, and intelligent parking mechanism has also been studied in some studies [6]- [7]. In a study [3,] an android-based system is created that automates parking and leaving the parking area, thereby regulating the amount of vehicles to be parked mostly on assigned parking structure.

Another study [5] describes a car alarm being activated and the owner being alerted via text message using GSM technology. A smart parking reservations, payment, and policing system has been addressed in several studies [8]-[10]. It has also been explained that there was a method of checking for a vacant spot, and the on-board computer interacts with gateway node and service terminals. A customer and thermal imaging prototype is used in another study [9] to identify downtown parking spaces. A parking spaces detection technique based on normalized cross-correlation of electromagnetic signals produced by magnetic properties sensors was discovered in a study [10].

Wireless networks are an appealing option for traffic signal control systems and parking garage applications because they are reduced and easy to implement. The use of a variation of electromagnetic and ultrasonic sensors for consistent and precise measurements is proposed in this study [11]. Our work to change our original WSN and apply it to parking areas is described in this study [12]. The difficulties encountered when applying our initial WSN to a parking lot are discussed, and solutions are suggested. This research [13] identified a car monitoring system that makes use of a highly modular remotely controlled wireless sensing device to address issues like versatility and power efficiency. The architecture of distributed expert machines was the focus of this platform's research.

The wireless communication and smart sensors are used in this study [14] to provide an automated and efficient parking service. The local parking service's introduction and a deterministic review are also discussed. This study [15] presents a full wireless communication solution for parking lot management. Following an overview of the current functioning implementation, which is focused on our DSYS25z sensor nodes, the device architectural design are mentioned.

The study [16] discusses the results of a number of real-world experiments on communication, sensing, and network capacity. It was suggested in this study [17] a parking control system that tracks vehicles driving into and out of, figuring out how many parking spaces are open, and finally disseminates the details to the customers of the parking lot. It demonstrates our design of an electromagnetic network system for vehicle monitoring. PGS, a smart parking system that is based on a wireless networks (WSN), is introduced in this study [18], which guides a driver to an accessible parking lot. A WSN-based VDS (traffic surveillance sub-system) and a managers keep make up the system.

Early results from an implementation of advanced parking techniques to enhance existing parking ability at the Different fan BART station, which opened in October 2014 in the East San Fernando Valley, are presented in this study [19]. Tracking purposes in the parking management system register the number of people passing and leaving the station's parking garages. Travelers may reserve spaces using the Internet, a touchpad (PDA), the web, or their mobile phone via a reservation system. The implementation of a true car park location device using a network of wireless sensors armed with permanent magnets is considered in this study [20]. Considerations for developing a reliable vehicle detection technique based on magnetic fingerprints obtained from wireless sensors are discussed.

III. METHODOLOGY

A. Block Diagram

A system architecture of this band is nothing but a connection of Arduino UNO, Sensor and Wi-Fi module which is all together. This can be further made more convenient or minimum in size by using wearable board. Each contain the necessary task.

B. Working

Initially, a RFID tag was inserted in to RFID reader. A RFID reader is being used to verify that the information fits the server. Is if information on the RFID Tag match the data in a database. A Relay Module would then

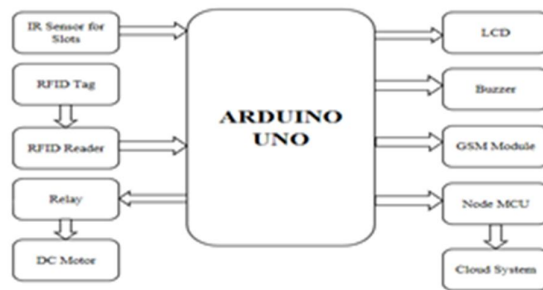


Figure 1. Proposed Model Block Diagram

receive a signal from Arduino Micro controller. A motor would be supplied by the module. A supply from its Relay Module would then drive its motor. Then gate would also open, and also a Lcd display can show the allocated slot number and a greeting note to a person who's already booked the desired parking spot. Following confirmation, that user will be permitted to park in such a desired spot. Unauthorized vehicles would not be permitted to park there in reserved parking area that has been allocated. If another user parks his / her vehicle there in designated parking space for that user. A vehicle with in preferred slot will be identified by the IR Sensor. The progress notification is then shown on the LCD panel. Unless the user parks the car with in incorrect slot, a IR sensor with in slot senses the appearance of an unwanted vehicle and delivers a warning data to the microcontroller. That wrong parking notification also will appear on a LCD display, and also the driver whom parked as in wrong slot may receive a buzzer tone alert. The Micro controller could send the signal to the GSM module after just a few seconds. This will send an unauthorized parking alert notification to a corresponding slot owners using the SIM installed there in GSM. Only with aid of IR Sensors placed there in slots, each vehicle entry and also the timing of entry will really be registered also on Cloud. That IR Sensor can turn the identification of a vehicle to counts, which will be registered on a Cloud using the Node MCU that is associated with the web. The recorded values would be saved as in graphical form, allowing us to quickly determine the inactive and active timings of every slot throughout the parking area.

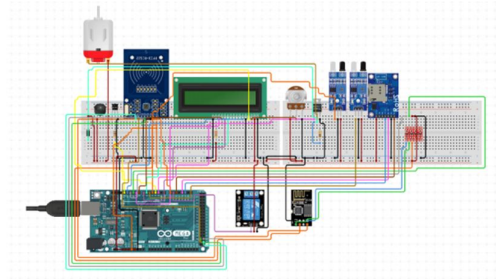


Figure 2. Circuit Diagram of Proposed System

C. Arduino UNO

It's an ATmega328-based micro-controller module. There will be 14 digital input/output pins, 6 analog inputs, a USB port, the power jack, and a reset button in that board. It comes with all you can do to help that micro-controller all you have to do is link one to a computer through USB as well as power. The voltage range suggested is 7 to 12 volts. The ATmega328 does have a flash memory of 32 KB. There's also 2 KB of SRAM as well as 1 KB of EEPROM on board. It has an ATmega8U2 that has been programmed also as USB to serial converter.

D. IR Sensor

It will have an infrared transmitter and receiver built directly in. The transmitter seems to be a lead that generates infrared radiation that hits the object as well as returns to the receiver in part. The sensor's output was specified due to the strength of its receiver's reception.

E. Node MCU

It was an open - sourced firmware for such prototyping board that's open source. The ESP-12 module of a ESP8266, which would be a Wi-Fi SOC and uses the "Lua" scripting language. It was a DIP (dual in-line

package) which includes a USB controller with a surface-mounted board which houses both MCU as well as antenna. The DIP format allows for the quick prototyping onto breadboards. It was commonly used in internet of things (IOT) systems.

F. RFID Tag and Reader

Radio frequency recognition that's what it's called. RFID tags uses radio frequency waves for transmit data wireless and without touch. It helps users to define and monitor inventory in such an automated and unique manner. To communicate via RFID tags, that RFID reader gathers radio waves. Information collected from tags is the transferred through a communications interface to a host of computer system, where the data can be stored in a database and analysed at a later time.

G. DC Motor

This is a type of rotary electric motor which converts electric energy into mechanical energy. It has an internal mechanism, both electro mechanical or electronic, that changes the direction of current inside a motor component on a regular basis. Its speed is adjusted over such a wide range through adjusting the intensity of current through its field winding and use a variable supply voltage. These can be used in a number of equipment, accessories, and appliances.

H. GSM Module

Global System for Mobile Communications (GSMC) is the acronym for the Global System for Mobile Communications. It is just a circuit that are being used to link a mobile device nor computer machine with a GSM network. It would be almost similar to normal phones, down and the need for a SIM card to recognize themselves to its network. This module includes a GSM technology or GPRS module that is operated by a power supply, as well as a computer communication protocol. It may be a specialized modem with such a serial, USB, or Bluetooth connection, or even a mobile phone having GSM modem functionality.

I. LCD

A liquid crystal display, or LCD, originally comes from its meaning. It is made up of two distinct forms of matter: solid than liquid. A liquid crystal is used to create a transparent image on an LCD. Liquid crystal displays (LCDs) are ultra-thin sites accordingly that are typically used in notebook computers, televisions, mobile phones, and mobile video games. As contrasted to cathode-ray tube (CRT) technology, LCD technology enables much thinner screens.

J. Buzzer

It is an apparatus that transforms an audio model it in to a sound signal. Mechanical, electromechanical, or piezoelectric are both possibilities. It's found in alarm systems and sirens. This is being used in a number of industries as just a means of audible detection with no need for a warning.

K. Relay

It is a switching device that is operated by the electric signal and electromagnet. It could be activated when the Arduino send the low power signal. When it activated, the electromagnet pulls the circuit to either open or close the electrical circuit.

IV. HARDWARE RESULT

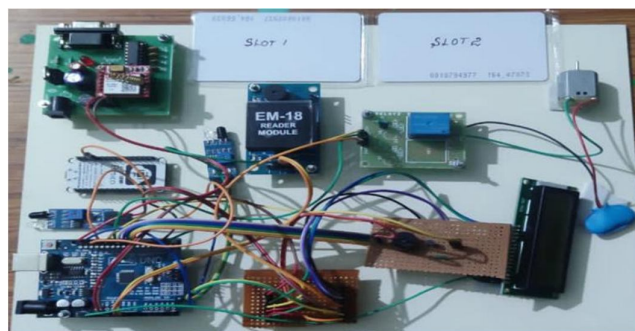


Figure 3. Hardware Setup of Proposed System

The hardware relation of the device structure is shown in Figure 3. We were using an Arduino UNO as a microcontroller for this project, which is connected to a Node MCU, a GSM module, and an RFID tag and reader. We were able to control the entire circuit with using Arduino.

V. SIMULATION RESULT

ThingSpeak is an open-source Internet of Things (IoT) framework and API for storing and retrieving data from stuff and over Network or through an Area Network by using HTTP and MQTT protocols. ThingSpeak allows developers to create sensor logging apps, location tracking apps, and a social media platform of stuff with wall posts. ThingSpeak was first developed by ioBridge in 2010 as an IoT application services department. ThingSpeak also provides support for MathWork's MATLAB ground-up tools, allowing ThingSpeak users to analyze and visualize uploaded data despite needing to buy a Matlab license from MathWorks.

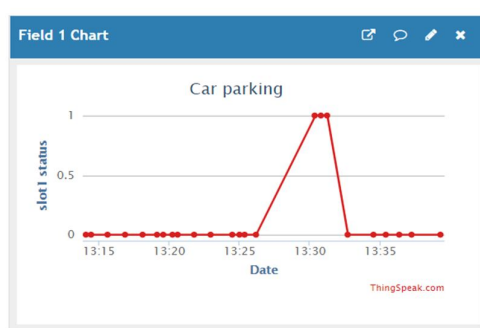


Figure 4. Parking Slot 1 Graph

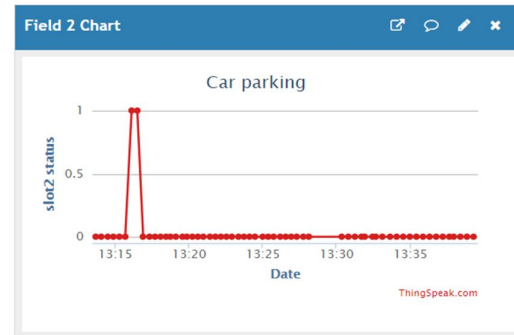


Figure 5. Parking Slot 2 Graph

We can track the slots to see whether a car is parking in a specific slot, as well as check the entries and exits of a specific vehicle, using these apps. The graphs for slots 1 and 2 are shown here. If the value is 0, it means that the slot 1 register car has reached the open doors. If 1 is true, it means that a specific vehicle was parked in a specific slot. The plot instead drops to zero, indicating that the vehicle has exited the slot as well as the gate. The date and time when the vehicle reached and exited the slot are shown. This help us to keep track of the vehicle and its activities. The Node MCU is used to submit these measurements to the cloud system.

TABLE I. VEHICLE PARKING TIME TRACKING

Intime (X)	Outtime(X)	Duration(Y)
7.30	9.30	2.00
8.45	11.15	2.30
11.30	4.00	4.30
8.35	11.45	3.10
2.36	4.47	2.11
7.56	11.23	3.27

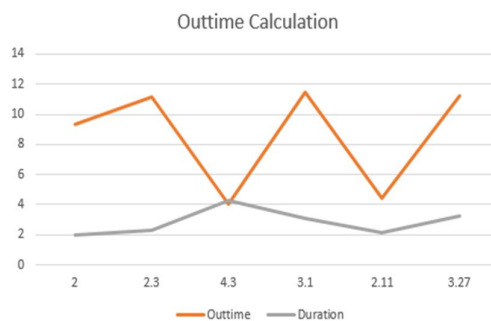


Figure 6. OUT Time Calculation Graph

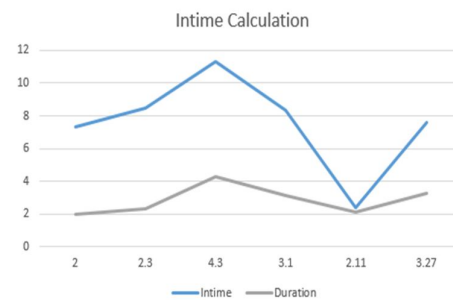


Figure 7. IN Time Calculation Graph

VI. CONCLUSION

The controller seems to be faster and more efficient in every ones work when it comes to managing parking space automation with such a number of vehicles. This prevents third-party as well as unauthorized vehicles from entering the private parking space, making it safer and less crowded. This paper also ensures that individual allocated parking spaces are accessible. This paper can be modified with such a user interface through GSM to making vehicle entry easier and also to promote vehicle protection by accepting only registered vehicles with in region and not accepting unreserved vehicles. By identifying the RFID tag with its respective image taken, such as colour, logo, and so on, we were able to secure the vehicle.

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