

A SMART CONTROL SYSTEM TO MANAGE UNAUTHORISED PARKING PROBLEMS

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Abstract: In our day to day life the traffic violations is increasing predominantly. A large number of personnel are deployed to check for unauthorized parking and fine those owners. But owners evade the fine by various illegal means like bribing the personnel, threatening them etc. Towing vans need to manually search for illegally parked vehicles. This system requires large overhead costs in manpower payment, fuel and other physical surveillance. Here we propose a system that allows for automatic illegal parking detection and alerting. The system consists of integrating an RFID transmitter in every vehicle. RFID receiver circuit is mounted on every area where parking is prohibited. If a vehicle is parked in an area where parking is prohibited the RFID transmitter comes in range of the receiver circuit. Once this happens the system gives a SMS alert to the owners who parked their vehicles in no parking area through Amazon SNS. If the vehicle is still parked, the system will again buzzer and then stores the vehicle information to the Amazon Dynamo DB by reading the transmitter id and then the RTO authorities handle the data and impose fine on vehicle and inform the owner.

Index Terms - Internet of Things (IoT), AWS IoT, Radio Frequency Identification (RFID), Amazon Simple Notification Service (SNS), Node-Red and Mqtt.

1. INTRODUCTION

Metropolitan cities has witnessed result a phenomenal growth in vehicle population. As a many of the arterial roads and intersections are prone to parking problems. The number of towing cases registered in one of the metropolitan city in the year 2017 was 270449, while in the year 2018(till Feb), the number increased to 29456 cases. By looking at this statistics, there is a need for design and development of a smart control system for effective parking management.

In spite of “No Parking” boards put up on the streets, owners still park their vehicles in areas where parking is prohibited. Further, these vehicles are towed off by RTO personnel or traffic police and the owners are imperiled to pay fine. Not only in public places but in many educational institutions, hospitals and secluded infrastructures, it creates chaos in parking management.

To address this issue, the study aims to design and develop a smart system which alerts (SMS) the vehicle owners at first. If the caution is ignored, then the vehicle information is processed and stored in a cloud. That can be accessed or transferred to concerned authorities.

Here we use RFID, it is a generic technology that helps in identification of objects through radio waves. It is part of a range of technologies that enables wireless data transmission and automated data collection which may include optical card readers, smart cards, bar codes etc.

2. LITERATURE SURVEY

Various information materials and scholar paper from the web regarding Parking Problems have been studied through in order to achieve the required information concern to this project. Among them, following are the key points extracted through:

2.1 The Scholar paper on Real-Time Illegal Parking Detection in Outdoor Environments Using 1-D Transformation by Jong Taek Lee, Michael Sahngwon Ryoo.

Gave us a brief knowledge of Developing Real Time Smart Approaches and helped us to choose the appropriate approach for developing "A Smart Control System to Manage Unauthorised Parking Problem Using RFID".

This paper focuses on methodology for detecting illegally parked vehicles in real time by applying a novel image projection that reduces the dimensionality of the data. Thus, reduces the computational complexity of the segmentation and tracking processes.

2.2 From the IEEE paper "Parking space detection using ultrasonic sensor in parking assistance system. In Intelligent Vehicles Symposium" By Park W. J, Kim B. S, Seo D. E, Kim D. S, & Lee K. H.

We got a proper way to implement our “Smart Control System”. As per it gave us the brief information regarding the proper use of Sensors.

A typical infrastructure-based method usually resorts to a pre-built map and infrastructure-level sensors.

2.3 The Research paper on “Smart Parking Applications Using RFID Technology” By Zeydin PAL & Nihat INAN.

Gave us a brief knowledge of Mobile Application Development Approaches and helped us to choose the appropriate approach for developing "A Smart Control System to Manage Unauthorised Parking Problem Using RFID".

The paper focuses on Using RFID technology to detect vehicles and allotting parking space. This technology will induce “automation” in parking system, and helps to save time in searching the parking space.

2.4 "On-street parking search" by Brooke, S., Ison, S., And Quddus, M. also provided us information on the Random Access Queue that Interferes with Traffic Flow.

The aim of this paper is to ascertain the perceptions of local authority policymakers in relation to parking search. City and county council officers within the East Midlands area of the United Kingdom indicate a lack of recorded evidence regarding the volume of vehicles searching for parking, which creates an issue both in terms of establishing the existence of parking search and in quantifying the level of the problem.

2.5 From International Research Publications House paper "RFID Implemented Parking System". By Sagar Yadav, Computer Science and Engineering, ITM University, Sector-23, Gurgaon, Haryana, INDIA.

As per it gave us the brief information regarding RFID technology uses RFID tags, RFID readers and RFID antenna. Different types of Tags.

A typical infrastructure-based method where the user data is stored in a database. When the vehicle checks in, the RFID reader reads the tag data. The software compares data with the database, if it matches the user can park the vehicle at authorized area only.

3. PROBLEM DEFINATION

- In spite of "No Parking" boards, owners still park their vehicles in areas where parking is prohibited.
- It has been a prominent issue in monitoring these vehicles which in case of public places, are subjected to towing by the RTO personnel.
- Further, the vehicle owners are imperilled to pay huge fine due to illicit parking.
- In many other institutions and non-governmental infrastructures, this creates chaos in parking management

4. EXISTING SYSTEM

At present parking a vehicle in a free space is a huge problem because of the lack of parking area. Currently traffic sign boards are put across the streets. The vehicle will be parked if the place denoted as parking area. Otherwise the people don't have the rights to parked in the unauthorized area. In-case if a driver parks the vehicle in that place then vehicle are towed off by Traffic Police and the owners are imperilled to pay fine. This may not be possible in all time. Because there is no electronic equipment or automatic devices are fitted in the board. There is no intimation earlier.

4.1 LIMITATIONS

- Lot of man power is required.
- A large number of personnel are deployed to check for unauthorized parking and fine those owners.
- But owners evade the fine by various illegal means like bribing the personnel, threatening them etc.
- Towing vans need to manually search for illegally parked vehicles.
- Lots of damage cause to vehicles due to towing.
- This system requires large overhead costs in manpower payment, fuel and other physical surveillance.

5. PROPOSED SYSTEM

The proposed system uses RFID technology along with the IoT and with an AWS Dynamo DB to view the data of vehicle that are parked in unauthorized area. Radio frequency identification (RFID) is a wireless data transmission which uses the electromagnetic field to identify vehicle's data automatically. If the vehicle is parked in unauthorized area then this system sends a sms through amazon SNS to the driver that it's a No Parking area. If the driver ignores the sms, then automatic case gets registered for parking vehicle in unauthorized place. The proposed system also aims to remove most of the limitations found in the existing system. It is designed to simplify the complex and redundant process of the existing system.

5.1 LIMITATIONS

- Here we propose a system that allows for automatic illegal parking detection and alerting through SMS.
- The system consists of integrating an RFID transmitter in every vehicle.
- RFID receiver circuit is mounted on every area where parking is prohibited.
- If a vehicle is parked in an area where parking is prohibited the RFID transmitter comes in rang of the receiver circuit.
- Once this happens the buzzer connected to the receiver starts beeping.
- It will continue beeping for few seconds and then alert the authority by uploading the vehicle information to the AWS IOT through Node-Red and MQTT, then the RTO persons will take further action.

6. DESIGN ARCHITECTURE

6.1 SYSTEM ARCHITECTURE

A system architecture is a conceptual model that defines the structure, behaviour, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system. A system architecture can comprise system components that will work together to implement the overall system.

The below figure shows a general block diagram describing the activities performed by this project.

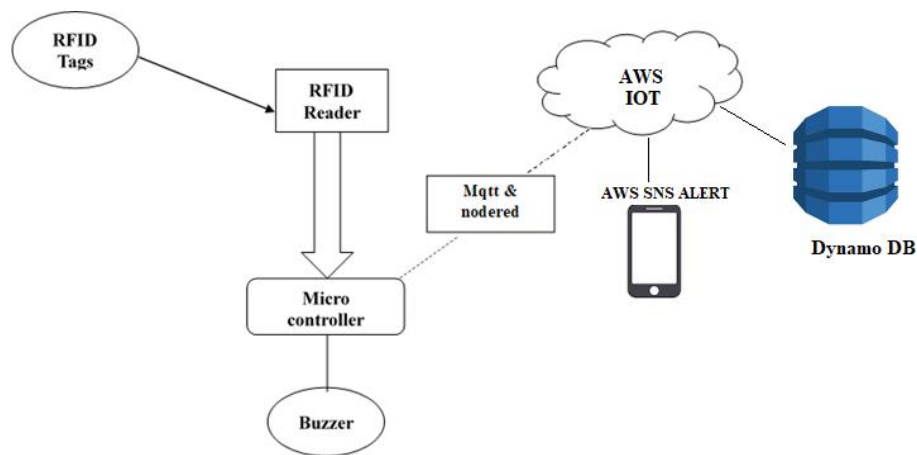


Fig 6.1: System Architecture

6.2 DATA FLOW DIAGRAM

With a data flow diagram, users are able to visualize how the system will operate that the system will accomplish and how the system will be implemented, old system data flow diagrams can be drawn up and compared with a new systems data flow diagram to draw comparisons to implement a more efficient system.

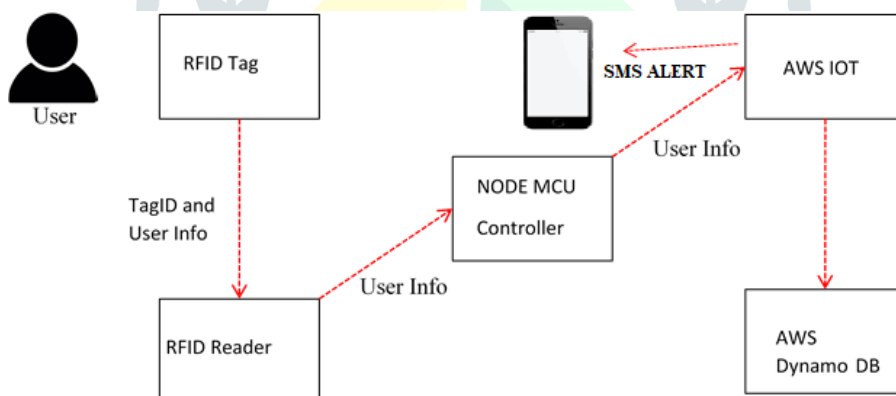


Fig 6.2. Data Flow Diagram

7. IMPLEMENTATION

The real time application of the system architecture consists of RFID tags that are affixed to the vehicles. These tags store information and data concerning to the vehicles and their owners that happen to intervene the restricted parking areas. A RFID reader is fixed in desired location of required frequency to sense the vehicle intervention. For the prototype we use tags of range 2-3cms. A microcontroller called NODE MCU ESP8266 is used to integrate the system components such as a RFID MODULE a buzzer and a Tags. This consumes low power 5v and is cost effective for the desired application. The whole set up is linked through the Mqtt, Node-Red and AWS IOT. Iot processes data via hypertext transfer protocol (HTTP) method.

When a RFID tagged vehicle cuts through, the reader reads the radio frequency and identifies the tag. Once the reader reads the data, a sms alert is generated by Amazon SNS and the owner is signaled about the constraints of No parking. If this caution is ignored, then the sms is generated to owner saying that no parking fine generated and the vehicle information is transferred to the Amazon Dynamo DB for further actions. The integration of the circuit is facilitated with the help of an antenna to transmit the information to the reader. For the prototype, there is no antenna used as the range is very less. The webpage can be interfaced with the database for monitoring purposes. Also this system can be used for customized parking in many institutions, hospitals and many other non-governmental infrastructures.

8. SCREENSHOTS

8.1 NODE MCU ESP-8266



Fig 8.1: Node MCU ESP8266 it's a controller that transfers data through Wi-Fi.

8.2 RFID READER



Fig 8.2: RFID Reader is used to detect the vehicle's data.

8.3 RFID TAG OUTPUT IN ARDUINO IDE SERIAL MONITOR

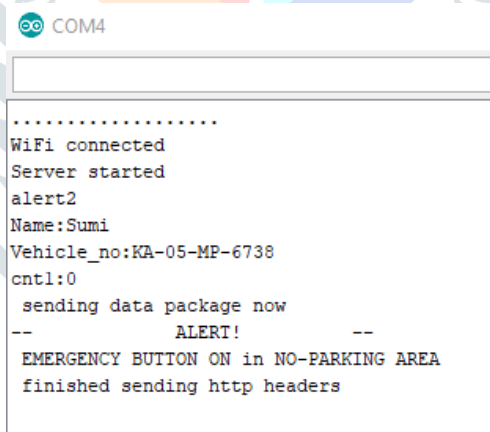


Fig 8.3: Successfully detecting vehicles data from a RFID reader.

8.4 NODE-RED CONNECTION

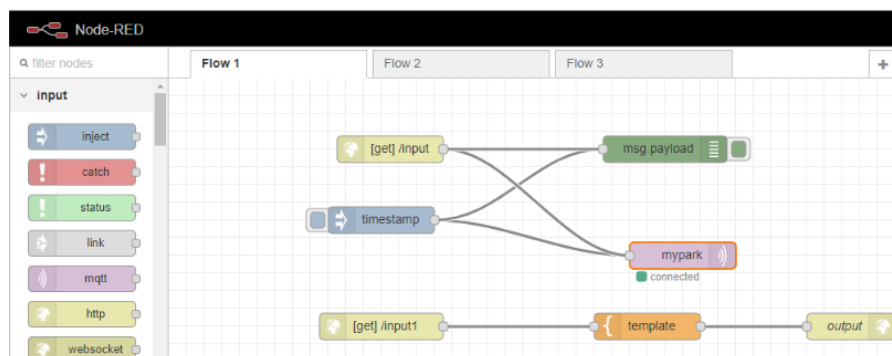


Fig 8.4: Node-Red connections. The data transferring from Node MCU to MQTT broker.

8.5 RECEIVING DATA IN AWS IOT

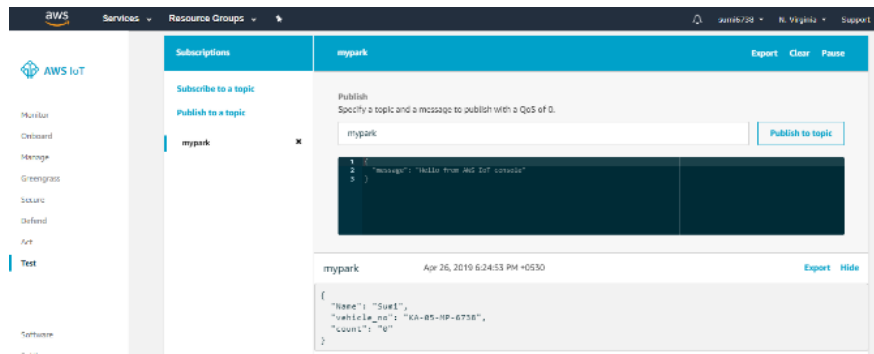


Fig 8.5: AWS IOT core (MQTT client) receiving data from MQTT broker

8.6 VEHICLE DATA STORING IN AWS DYNAMO DB

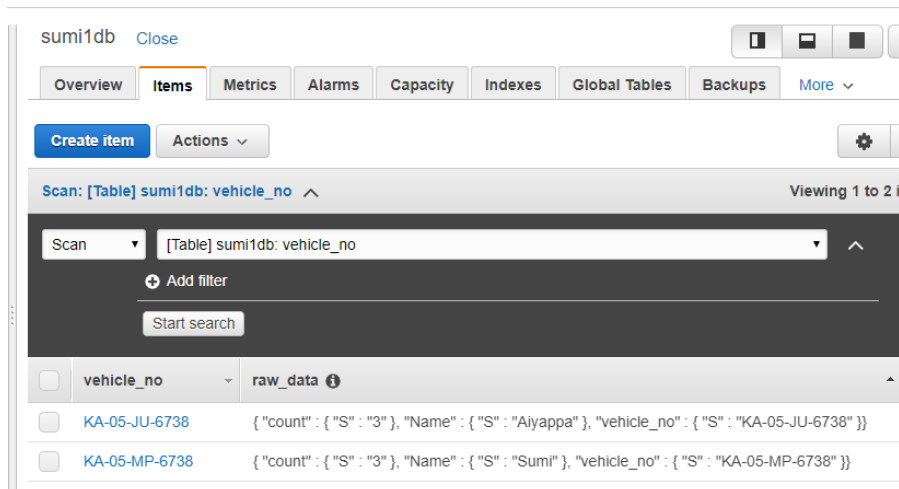


Fig 8.6: Successfully storing data in Amazon Dynamo DB

8.7 SMS ALERT THROUGH AMAZON SNS

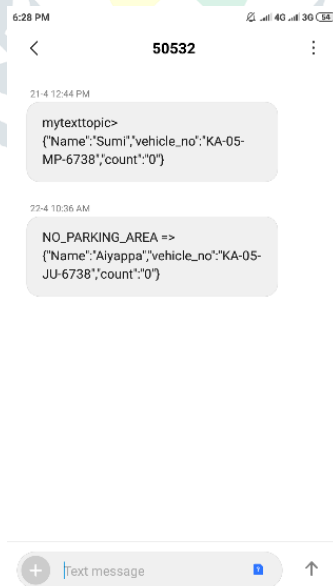


Fig 8.7: Vehicle owner receiving SMS alert for parking in unauthorized area.

9. CONCLUSION

From this we have concluded that by using RFID, unauthorized parking problems can be solved easily without any man power. If the vehicle owners park there vehicle in no parking area, this system detects vehicle details and sends a sms alert to the owner by AWS IOT with a triggering action of Amazon SNS. By this system the database can be shared with local Traffic Police and RTO personals for further actions on unauthorized parking. Therefore this is used to reduce the no parking problem in a metropolitan cities. We have confidence that our project going to build much better than the current process.

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