

# Aid for Blocked Car and Towed Car Using Internet of Things Techniques

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DOI: <https://doi.org/10.26438/ijcse/v7si15.610> | Available online at: [www.ijcseonline.org](http://www.ijcseonline.org)

**Abstract**— Internet of Things (IoT) plays an effective role in connecting the surrounding environmental things to the network and made easy access things from any remote location. Driving the vehicle which is blocked in the random parking areas is very difficult and time taking. The vehicle can be towed from anyone that is unknown to the driver until him/her return to the parking area. Structured modular concept is used to design the system. The system implemented using ultrasonic sensors, renesas microcontroller, GSM module, IR sensor and MATLAB. The proposed system gives the solution to drive out the blocked car and also recognized that car is towed.

**Keywords**—Structured modular design, MATLAB.

## I. INTRODUCTION

The Internet of Things or IoT is a system of interrelated computing devices, mechanical and digital machines, objects and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The Internet of things (IoT) is the network of devices, vehicles, and home appliances contain electronics, software, actuators and connectivity which allow these things to connect, interact and exchange data.

Traffic is one of the biggest problems faced in urban life in India. While in developed countries, even the richest of the rich use public transport, in India there is a class divides when it comes to using public transport. This has led to an exorbitant increase in the number of private vehicles leading to an increasing number of traffic snarls. One of the major problem due to increase of vehicles the problems with parking lots. Vehicle management at the parking lots has become an important aspect for the best utilization of existing parking area capacity. India is facing a new problem now a day's lack of sufficient parking place. The situation is such that on any given working day approximately 40% of the roads in urban India are taken up for just parking the vehicles. This leads to the blocking of vehicles by other vehicles and also unexpected towing. Traffic condition in foreign countries is homogeneous whereas India's traffic condition is heterogeneous which makes real-time management at parking lot difficult [1]. To resolve the parking problems various smart parking technique are implemented, but the smart parking techniques are only used in parking lots not in the open parking areas.

In this paper a new approach is used for taking out the vehicles which are blocked by the other vehicles and also

when the vehicle is towed it notifies the owner is proposed based on structured modular design concept.

1. Detection of vehicle blocked by other vehicles.
2. Alert the owner by sending the alert message, and initiate the camera to capture the number plate of blocked vehicle.
3. The captured number plate numbers are extracted by using MATLAB, the number is send to the database.
4. Database find out the contact number of the blocked vehicle person and send the alert message to that person also.
5. When any person tries to tow the vehicle then the alert message is sent to owner in the form of voice output.

In the system the database is maintained that holds the vehicle number along with the owners contact number. When the vehicle blockage happens then the number from database retrieved and the alert message is also send to the blocked car owner. The proposed system will also give the alert message when the vehicle is towed by some other person by sending the voice output to the owner using the android app. In section II we describe some of the related works. In section III we describe about the methodology. In section IV we discuss about the result and in section V we summarize our conclusion.

## II. RELATED WORK

Today more main stream cars are connected directly to the internet than in the past, via 3G or 4G networks. This level of connectivity has enabled engineers to develop custom-made applications/software for each car and has encouraged numerous ITS application scenarios. One of the important and growing fields in ITS is parking assist and Parking Guidance and Information (PGI) systems. Monitoring

vehicles for law enforcement and security purposes is a difficult problem due to the number of automobiles on the road. This can be achieved by using automatic number plate recognition (ANPR) which uses image processing technique and optical character recognition (OCR) approach to define the individual character of the number plate. There are various methods used in vehicle license plate recognition system in order to obtain the data of the license plate.

### 1. Automatic Vehicle License Plate Recognition System based on Image Processing and Template Matching Approach

A vehicle license plate recognition system is an important proficiency that could be used for identification of engine vehicle all over the earth. It is valuable in numerous applications such as entrance admission, security, parking control, road traffic control, and speed control. However, the system only manages to identify the license number and needs an operator to control the collected data. Therefore, this paper proposes an automatic license plate recognition system by using the image processing and template matching approach.

### 2. A New Approach for Vehicle Number Plate Detection

Identification of cars and their owners is a tedious and error prone job. The advent of automatic number plate detection can help tackle problems of parking and traffic control. The system is designed using image processing and machine learning. A new system is proposed to improve detection in low light and over exposure conditions. The image of vehicle is captured, which is pre-processed using techniques like grayscale, binarization. The resultant image is passed on for plate localization, for extracting the number plate using CCA (Connected Component Analysis) and ratio analysis.

For instance, Rajput and Som [7] proposed an automated vehicle license plate recognition system framework that automatically seeks to overcome the shortcomings of existing approaches. It consists of three phases: image capture, license plate localization, and number recognition. After the extraction of the characters from the number plate, it will be sent to further processing for mapping the characters to the respective contacts in the android user application.

## III. METHODOLOGY

In order to find the solutions for the issues in the parking lots in the smart cities structural modular technique is used. Where one user can recognize the blocking car user details, so that one can contact them by sending message alert to clear the path. It also helps in identifying the vehicle towing.

A. The system helps the vehicle owner when the driveway is blocked.

B. The system also helps the user to identify the Towing of the car.

The main key technique is image processing of the number plate to extract the characters by using the OCR algorithm. The requirements of this system for vehicle blockage detection mainly composed of a single microcontroller, Ultrasonic, GSM, MATLAB and Android app. The requirements for vehicle towing are IR sensor, microcontroller, GSM and Android app.

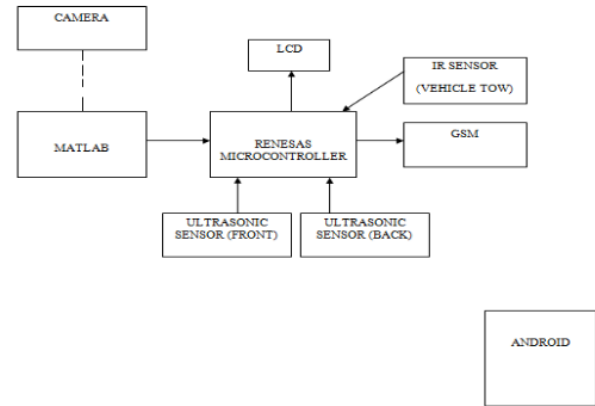


Fig 1: Block diagram of the system.

A. The system helps the vehicle owner when the driveway is blocked.

The blocked driveway system works in the three stages. Initially vehicle blockage is found and user is notified. 1. Blockage detection, 2. Vehicle plate recognition, 3. Searching the owner number by using the vehicle number plate.

#### 1. Blockage detection

The vehicle blockage is detected by the ultrasonic sensor. The ultra-sonic sensor is placed in both the front and the back end of the vehicle. The ultrasonic sensor HC-SR04 is used in the system.



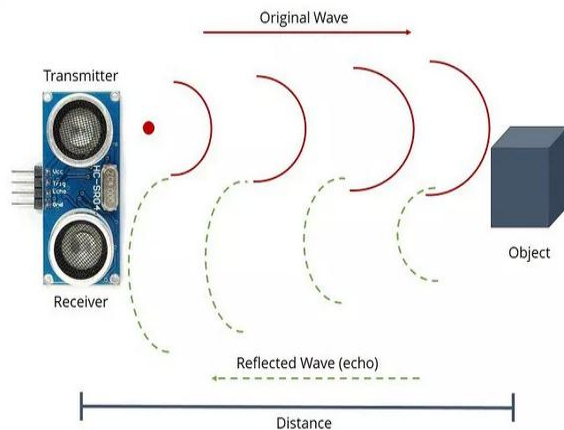
Fig 2: Ultra-sonic sensor HC-SR04.

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The sensor requires 5 volt input power supply. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

- (1) Using IO trigger for at least 10us high level signal,
- (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- (3) IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

$$\text{Distance} = \text{Speed} \times \text{Time}$$



**Fig 3: Working of ultra-sonic sensor HC-SR04.**

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module. When this happens then it results that respective way is blocked. When both the ultrasonic sensor detects the vehicle is blocked then the vehicles driveway is blocked. If any one of the ultrasonic sensor detect the vehicle is not blocked then there is way to drive the vehicle away from the parked area.

## 2. Vehicle plate recognition

When the vehicle is blocked then the renesas microcontroller which has the decision making capacity. It initiates the camera automatically. The camera captures the image of the blocking car number plate. The number plate of the blocking vehicle is processed in the mat lab using the ocr algorithm, it is an image processing algorithm. Optical character recognition or optical character reader, often abbreviated as OCR, is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text. The steps in the OCR ALGORITHM

Step 1: Loading the image file

Step 2: Improving image quality and orientation

Step 3: Removing lines

Step 4: Analyzing the page

Step 5: Detecting words and lines of text.

Step 6: Analyzing and fixing of broken or merged characters

Step 7: Recognizing the characters.

Step 8: Saving the file

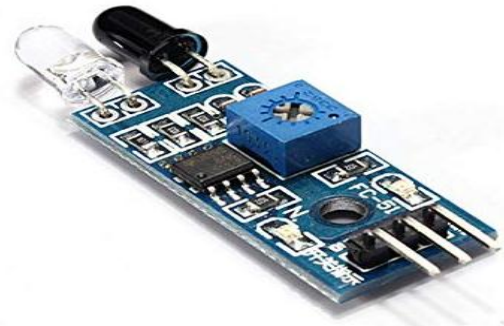
After these steps the machine code of the text is founded and it is sent to the micro controller. The microcontroller in term sends the vehicle number to the android app. Where furtherer processing is done.

3. Searching the owner number by using the vehicle number plate.

After the image processing stage we will get the vehicle number plate. The vehicle number plate is sent to the android app using the GSM. In the android application we will maintain the database which contains details like vehicle number, respective owner name, phone number. When vehicle number is given by the microcontroller to the android application. The program will search for the vehicle blocking owner phone number and an automatic message is sent to the blocking user requesting to remove the vehicle.

B. The system also helps the user to identify the Towing of the car.

To detect the vehicle towing IR sensor are used. When the IR sensor is activated it is known that vehicle is towed, and then the microcontroller will send the message to the user using GSM. And the voice message is popped out to notify the user.

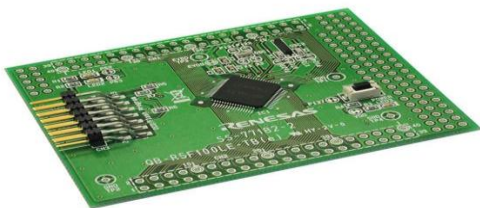


**Fig 4: Infrared sensor HC-SR04.**

An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo-Coupler or Opto-Coupler. As said before, the Infrared Obstacle Sensor has builtin IR transmitter and IR receiver. Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye. Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined. When obstacle is detected the microcontroller sends the alert to user using GSM.

C. The Microcontroller.

The Renesas microcontroller is the heart of the project it is programmed such that it keeps on commanding and controlling the complete action through peripherals connected.



**Fig 5:Renesas microcontroller [R5F100LE]**

It is a 16 bit microcontroller. It contains IC-R5F100LE and it consists of 16 pin IC.it requires Power supply of voltage:  $VDD = 1.6$  to  $5.5$  V. It has General-purpose register:  $8 \text{ bits} \times 32$  registers ( $8 \text{ bits} \times 8$  registers  $\times 4$  banks), ROM: 512 KB, RAM: 32 KB, Data flash memory: 8 KB. On-chip single-power-supply flash memory (with prohibition of block erase/writing function). It acts as controlling unit of the system which controls all the components in the system. The microcontroller is built in the arduino kit. Using the kit we connect the components to the microcontroller. And power supply to each component through the arduino kit.The code is dumped into the microcontroller using the flash magic. Based the code written in the microcontroller every decision is done by microcontroller.

#### IV. RESULTS AND DISCUSSION

The implemented structural modular technique helps to avoid manual checking of parking lot, whether any one blocked the driven way or not by using the modular technique user will get the message if the vehicle is blocked. By these smart techniques using an IoT can resolve the problems in the parking areas. A system having camera attached with Microcontroller (Renesas) is installed on the entrance. Microcontroller will be attached to a camera which is responsible for applying the algorithm. Microcontroller can perform the OCR Scan at a quick rate and send the needful data to the server, for validation of the Number plate, stored in database. Camera gives the image of vehicle number plate to the Microcontroller whenever vehicle number plate appears according to the algorithm. Applying image processing algorithm will give the needful data from the raw image. This data will then be send to the microcontroller for further processing. The resolution of image can be increased for the clarity of the number plate image. The number plate is received by the microcontroller and the owner detail of respective number plate is searched in database. The

#### V. CONCLUSION AND FUTURE SCOPE

The system can be used by any person who is in need of it. The system is helpful in random parking area. A parking slot can effectively use, as there is solution for blocked way. A solution for the blocking and towing of vehicle is provided by the system. There is no need for user to go and check manually. The project can be used by the government to overcome the parking problem. Then it needs to be hosted in the server.

##### A. Abbreviations and Acronyms

The various words and there definitions which are used this paper are as follows:

- **MATLAB:** Matrix Laboratory is a multi-paradigm Numerical computing environment and proprietary Programming language developed by MathWorks.
- **OCR:** Optical Character Recognition. It is a algorithm used for image processing.
- **LED:** Light Emitting Diode.

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#### ACKNOWLEDGMENT

We would like to thank our principal Dr. K Chennakeshavalu and head of department Dr.ArunBiradar , East West Institute of Technology, Computer Science and Engineering for supporting us to carry out our project with clear guidance from Assistant Professor Mr Hemanth Y.K.

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