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# Video Surveillance for Collision Detection and Traffic Analysis using IoT

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## Abstract

**Objectives**: The main object of this paper is to share information of collision detection, Location of incident, number plate recognition of vehicle and Traffic information to crowd sourcing on map. In this work a car can send video automatically to cloud for multipurpose. **Methods/Statistical analysis**: In this project video is continuously monitoring in car which is being recorded in car and it is also connected to internet. This photo and video can be shared to other people where this information can be very useful in traffic condition and emergency situation to help other people. Using this information, the response time can be minimizing. **Findings:** In this system video surveillance and number plate recognition is used to extracting more information about incident in a car at real time. The video surveillance and number plate recognition in car can be very useful. The recorded video will be very helpful to record all the activity surround by car and also can also be very help for proof of evidence for suspicious activity. **Application/Improvements:** This work can be enhanced by proper sharing resources of camera between number plate recognition and video sharing in real time.

**Keywords:** GPS Module, Map, Raspberry Pi, Web Camera

## 1. Introduction

Over the last few years' personal motor vehicles are increasing day by day and hence causing city-based traffic more and more crowded and dense. As a result, traffic watching and supervising is becoming one of the very important problems in big smart-city all over the world. Some of these concerns are traffic jam, accident of vehicle and stolen of vehicle that mostly cause a wasting time in traffic, property damage related to surrounding conditions or the health of the smart city. Any type of crowding and blockage or crowdness on the roads will leads to traffic jam and also due to rash driving in crowd may cause severe damage or loss. Therefore, there is an immediate need to improve traffic management services. The appearance of the Internet of Things (IoT) provides a new solution for smart traffic development by car camera information sharing by the driver to other people in crowd sourcing. One of the biggest problems in the world right now metropolitan cities is Traffic accidents. Most of the accidents caused injuries or either worse death. When a traffic accident occurs it is always reported by traveler who is passing from that way and also we do not have any information how accident has occurred. This proposal wants to describe the monitoring and alert system for the traffic condition, road conditions like pothole, whether condition, some accident of vehicle or own car accident, number plate and even crime related incidents in the city. In the first phase, we are monitoring the traffic condition, road condition and vehicle number. In the second phase if we see any suspicious or emergency alert that user should know then we can share this information in terms of photo, video, location and number plate of vehicle. In this proposed research work the author has combined the information given by one user to other user using Internet of Things (IoT). In number plate recognition we can find out the number plate of vehicle which can give additional information on demand like owner of vehicle. This num-

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ber plate recognition application can be used to find out who is following us by continuous monitoring the vehicle number plate using web camera placed in car. In emergency situation[1] the rescue team always want to know how to reach at particular location of incident, what incident has happened and who has collided with whom or there is urgent need of medical emergency. The task of rescue team is to minimize the time for rescuing and utilize latest technology and source of information.

## 2. System overview

In this system we assume every car has installed a web camera and it is connected to internet using Raspberry pi. When every car (user) is connected they can share the data whenever they see any important information in picture, video or number plate. Analytic server is the part of a system where number plate recognition and giving back result to the user for information purpose whether any particular number is following us or it can be used for diplomat people or stolen vehicle. The Figure 1 is showing in this proposed work model the Raspberry Pi is connected to web camera using USB, GPS using UART and mobile tablet using remote login VNC android application further Raspberry pi is connected to internet using Wi-Fi network adapter and with analytic server. Figure 2 shows proposed system model. For sending photo or video to other people. The author has used FFMPEG encoding because it provides good compression of data in Linux. Using GPS coordinate we can share the location of incident. According to high level architecture[2] in Figure 3 showing that each layer has different –different area of work. This layer is divided in[3] part like data collection, information management and dissemination. In data collection process we try to collect as much as information we can collect. This data can consist multiple form of data like location of incident using GPS coordinate, photo of incident, video of incident and number plate of vehicle. In information management system we try to verify the information given by traveler to others. In dissemination we share information others as much as possible. All people have same option for reporting about the incident. Citizen are always considered best source information. For sharing information their lot of crowd source are available like Facebook, Twitter and YouTube. as information shared by some people it is instantly available to all users. The author has also created a google my map and website iot4.wordpress.com then this google created map uploaded on this iot4.wordpress.com where people can see the google map on this website as platform. We always believe that all people have Dash board camera installed with Open CV[3], ALPR (automatic license plate recognition) and internet in to powerful raspberry pi 2. However, there are other powerful available in the market like Beagle Boneblack, Intel Galileo and Panda board but cost wise raspberry pi I cheaper so that author is raspberry pi to make cost effective product.

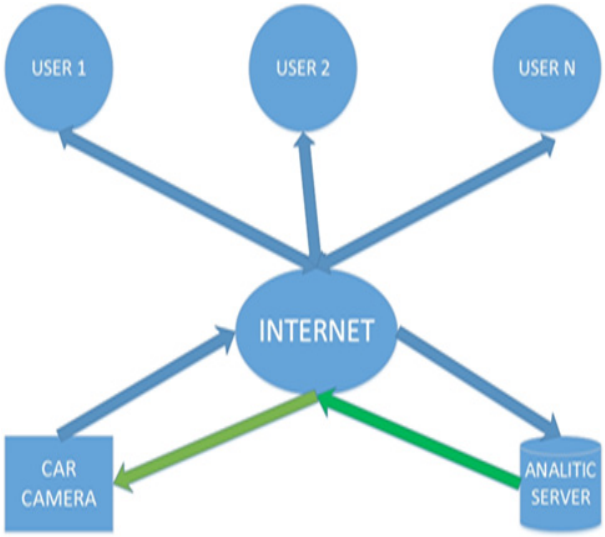


**Figure 1.** System overview.

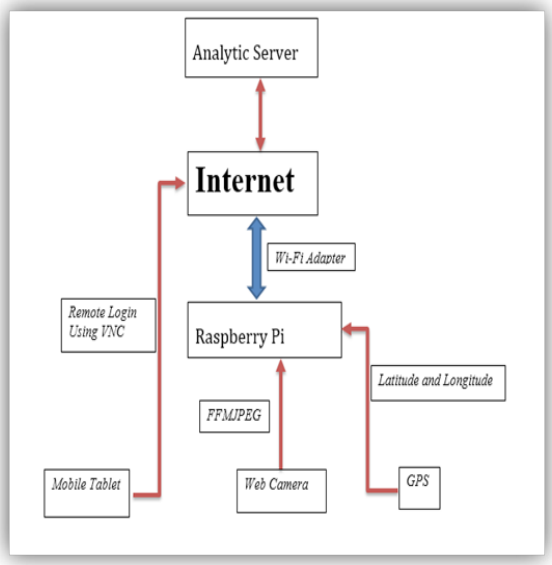


**Figure 2.** Proposed system model.

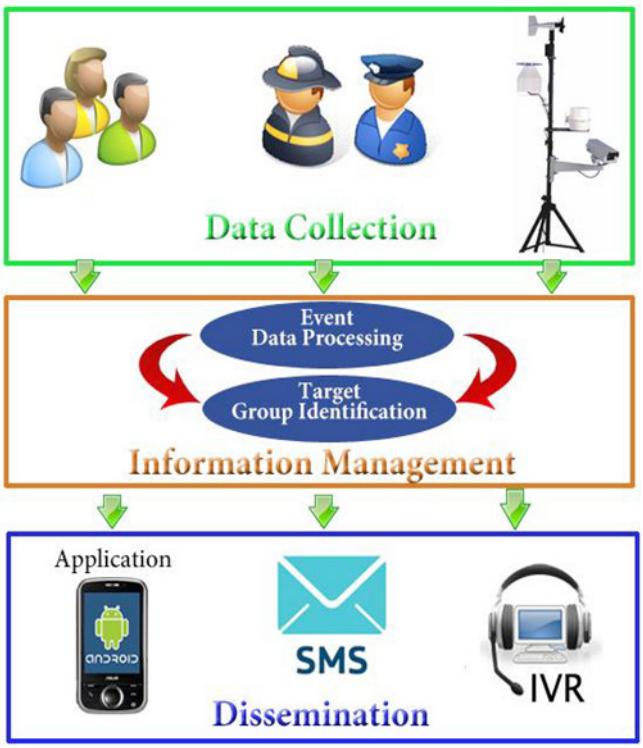


**Figure 3.** High level architecture.

## 3. Implementation

The implementation can be describing in two phase

1. Software phase
2. Hardware phase

### 3.1 Software Phase

In software phase we have made a dashboard GUI by a python script for giving user input. This GUI consist 5 sub python script which represent each function represent in the button control. This GUI controlled by driver. For finding number plate we have installed Open CV, Tesseract, Leptonica and ALPR. However, for performing number plate recognition on Real time video in the raspberry pi is lagging due to huge data processing in Raspberry pi so for finding number plate, camera grab the image from car which is installed in raspberry pi then apply algorithm for noise removing, Sobel filter, adaptive threshold, Gaussian blur and then Optical Character Recognition using tesseract. Hence whenever driver see any emergency information then that incident can be record in to raspberry pi storage and from there user can share location, accident vehicle picture, video of incident and number plate of vehicle. Figure 4 given show Dashboard GUI in android based mobile tablet. The Figure 5 show google my map where we assume all car running and car have hardware fit in to the system. The map part is my google map created by author using google Map. The location is taken near VIT Chennai for experiment purpose.

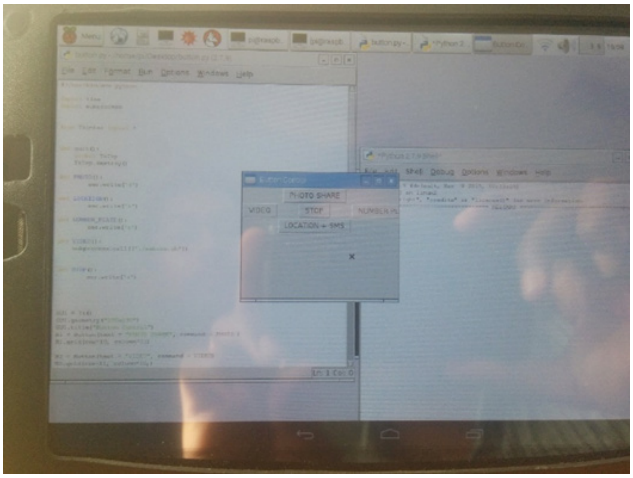

**Figure 4.** Dashboard GUI in mobile android tablet.

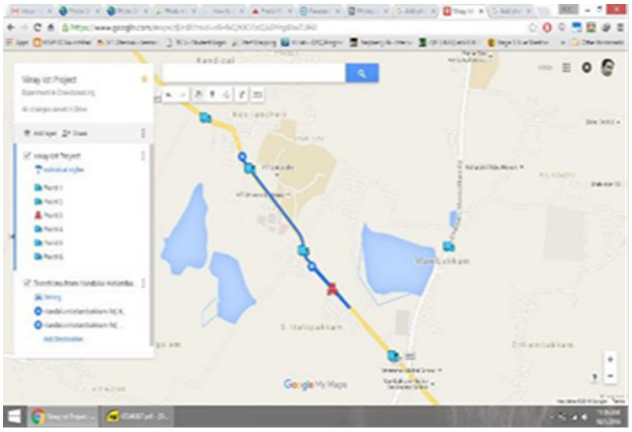

**Figure 5.** Show my google map.

#### *3.1.1 Photo Share*

In this phase whenever driver see any accident information then he can share this photo to other people where it can be very helpful. Figure 6 show the accident information in map. And Figure 7 shows some pothole in the road. So people who is coming in very high speed they can be worn from this pothole.

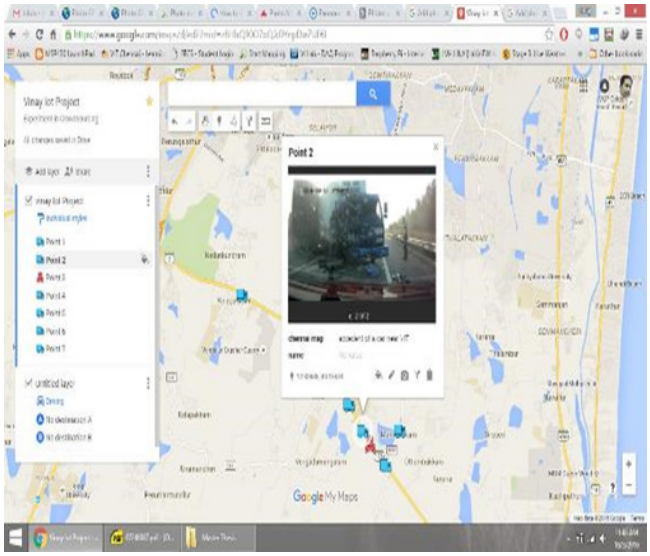

**Figure 6.** Show the accident information in map.

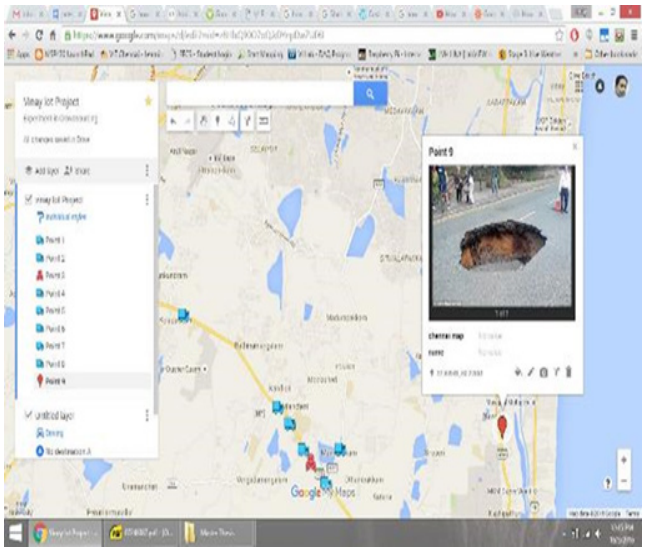

**Figure 7.** Shows some pothole in the road.

### *3.1.2 Video Share*

In this part we record the video of accident, any valuable crime scene video footage and then sent YouTube or google drive where it can be utilized for proof of evidence. For recording video, we use libavcodec encoder libraries. The libavcodec project is a fork of the FFMPEG project which is based on Linux. This video converter also works for live video recording and broadcasting. The Figure 8 shows video of incident. For experiment purpose we are sending 10-minute video on google drive. Figure 9 shows video uploaded in google drive[4] using a shell script which is running in Raspberry pi.

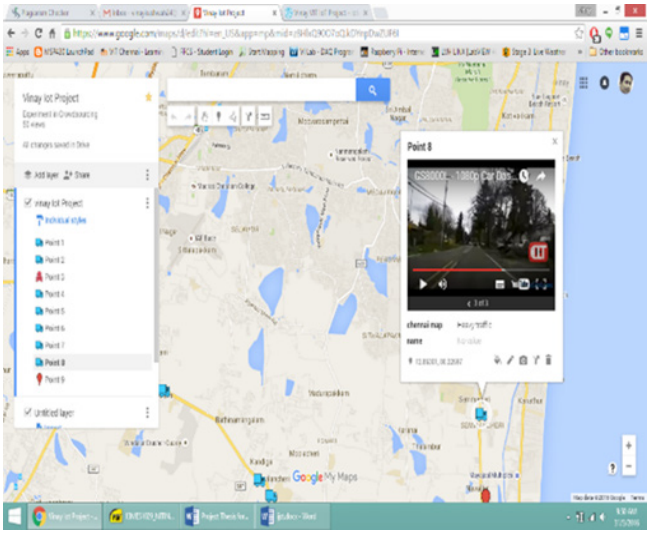

**Figure 8.** Shows video of incident.

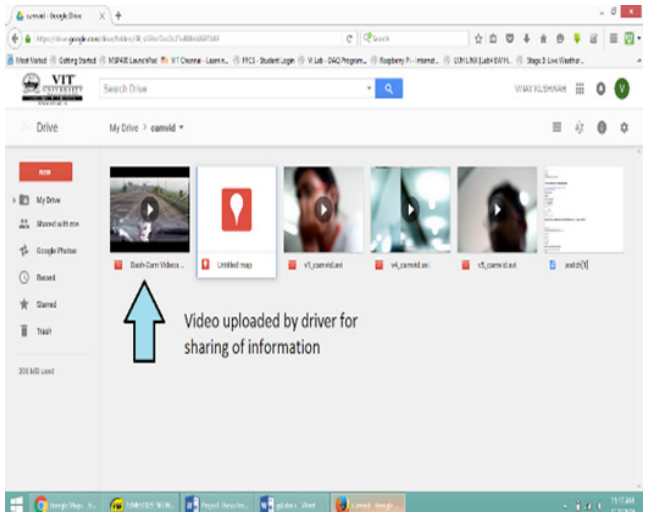


**Figure 9.** Shows video uploaded in google drive.

### *3.1.3 Location and SMS*

In this system we share the location of incident and SMS alert for collision of vehicle[5,6]. For sharing GPS location, we use one python script which keeps on reading GPS coordinate and it is called CGPS daemon. When collision occurs it will send GPS location and SMS to rescue team. For sending SMS we are not using any GSM module but a SMS gateway which is python based and works using internet based gateway. The gateway name is way2sms. com. So whenever the event is going to occur it will send the SMS and GPS coordinate for finding location of event. Figure 10 show image of location of vehicle on map and Figure 11 shows SMS received.

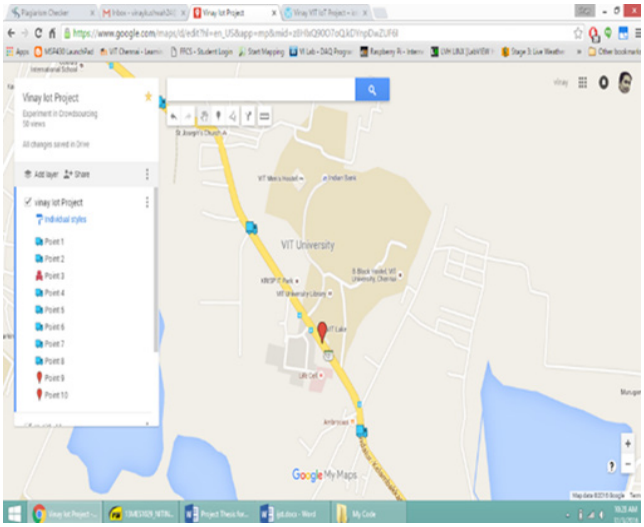


**Figure 10.** Show image of location of vehicle on map.


**Figure 11.** Shows SMS received.

### *3.1.3.1 Automatic License Plate Recognition (ALPR)*

In automatic license plate recognition, we identified the number plate of vehicle for sharing[7]. In this application if there is rash driving by someone on the road or any particular vehicle is following us then that number plate can be share. For identifying the number plate, we have used open ALPR. Open ALPR is open source software for identifying the number plate of the vehicle. This ALPR software runs in Raspberry pi. The ALPR software running in the Raspian OS is shown in Figure 12.

## 3.2 Hardware

In hardware section author has used Raspberry Pi, USB, web camera, Mobile Android tablet for making dashboard screen and GPS. Apart from this when user try to connect hardware and login they should be in the same mobile network otherwise port forward will be required when accessing raspberry pi from global IP.

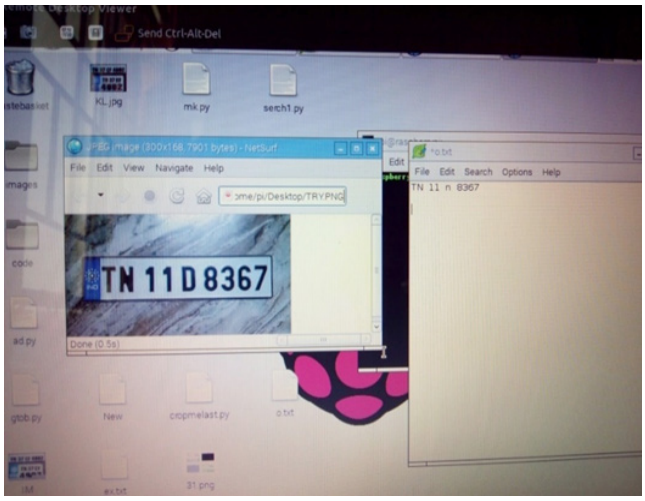


**Figure 12.** ALPR running.

# 4. Results

In result the driver will have the option of button control. This button control option will be placed in dash board navigation screen. This screen has the function to share information in multiple form like photo share, video share location shares and number plate share. The hardware setup is given below in Figure 13. When the road is ideal or heavy traffic of vehicle then by sharing the information people can take alternative route to the destination. In this proposed work we have assumed that all

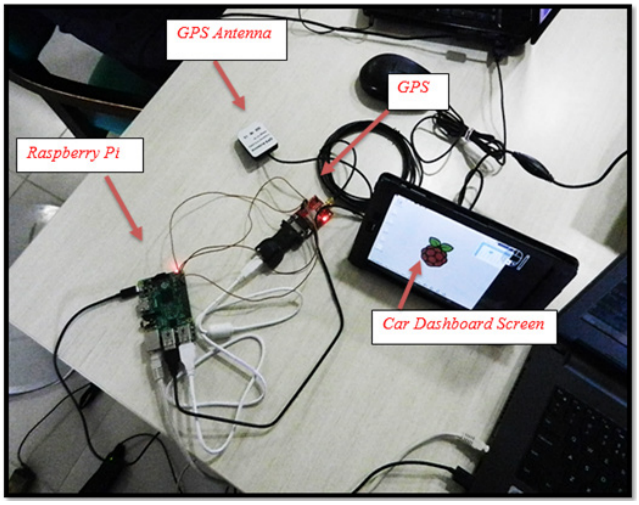


**Figure 13.** Hardware setup.

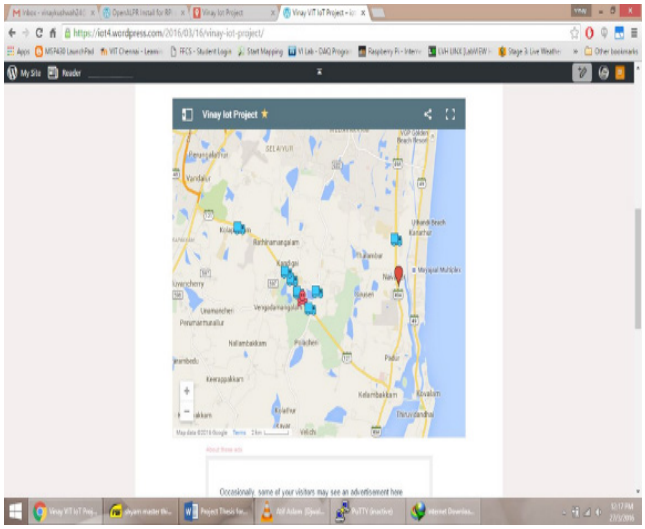


**Figure 14.** Word Press website map.

car is connected to the internet. The GUI for dash board is made one python script. This script consists 5 sub python script. Whenever we touch individual option given in GUI then that action will be performed. The author has made a Word Press website. This website can work as a platform for sharing information to each other. This website name is iot4.wordpress.com. On this website we assume that all people can see each other location on the map. The Figure 14 of the map is shown below. For prototype we have made this free Word Press website where user can share the emergency information required to each other.

## 5. Conclusion

So according to this paper the author has proposed a work based on web camera, GPS, Raspberry pi and mobile android tablet using internet of things. In this application the values obtained by driver can be very useful and thus allowing number of vehicle to share the information to city authorities and crowd sourcing. The author has also proposed live video streaming of vehicle whenever user wants to share things lively. This application can play key role in emergency management system. The sharing photo, video and location of incident, heavy traffic and number plate can save can give immediate response in ubiquitous environment.

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