# Automated Vehicle : The Prospective of Road Safety

Namratha M M, Navya M N, Niharika R, Namitha N V
Dept. of Electronics and Communication Engineering
GSSS Institute of Engineering and Technology for Women
Mysore, India

Sunitha R
Dept. of Electronics and Communication Engineering
GSSS Institute of Engineering and Technology for Women
Mysore, India

***Abstract* - Road safety is a concern of everyone in the current scenario of increased vehicular traffic. Internet is part of our daily life and available in most of the places because of revolution of electronic communication. It has become an integral part of our lives. We are living in a world of automation. Almost everything around, us is automated. Automation plays an important role in the field of transportation. As of now, vehicles are just monitored but not automatically controlled pertaining to the road safety rules. In this work a system is designed for automatic control of vehicles in restricted areas, where the safety signage boards are installed. The four applications namely speed control, hump detection, no parking and no horn zone are implemented using IoT.**

***Keywords - Internet of Things; Automation; Road safety rules;***

## I. INTRODUCTION

The internet of things influences life style of individuals and become part of daily activities. IoT is a giant network of connected devices that gather and share data. The network is based on sensors embedded in most of electronic devices. Data from these sensors is transmitted to IoT platform and platform retrieve the information and perform the required computations and action. Cloud acts as a remote place for data storage. In a typical cloud storage, the information is transmitted via internet to a data center rather than storing locally on a computer hard drive. The data consists of images, videos, GIF or any other text files. They can access the data any time from any part of the world by using an internet connection and through mobile or PC.

Raspberry pi is basically a microcontroller with additional features like bluetooth , Wi-Fi and USB port capabilities. Ri is one such module that provides network connectivity and other required computing power to transmit data to the cloud. Arduino is an open source electronic platform. Arduino board facilitated to perform input/output operations and customized computations. Vehicle monitoring systems consists of vehicle tracking module that works with global positioning system to track the vehicle's movement and locate it. The location can be stored on tracking device or transferred to devices over internet or other cellular, radio or satellite modem. This device, when installed in the vehicle, collects all the data, allowing an efficient fleet. [6].

Based on world health organization(WHO) report, 94% of total road accidents happen because of human error. The two main factors which cause accidents are fatigue and distraction. Where 70% of the time it is due to driver's distraction towards road safety rules. In order to overcome such situations, an effective automated vehicle monitoring system has been developed.

Road safety surveillance technology has the potential to provide a wide range of safety benefits. The integration of various modules are depicted in Fig. 1.

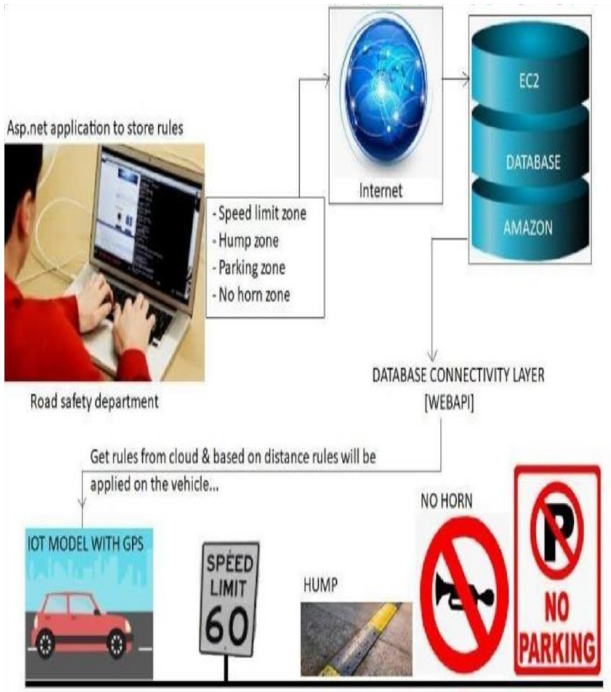


Fig.1 Overview of road safety surveillance system

In this system the admin can able to create, update or delete the database (signboard information) through the web interface and the necessary action is performed based on vehicle's current location.

## II. LITERATURE REVIEW

Earlier works on this topic are studied thoroughly and it is observed that many interesting works have been reported in the literature.

Begum et al[1] proposed an automatic speed control system in which, if the vehicle exceeds the specified speed limit then the warning message is generated. Sai et al[2] devised a method on automatic vehicle horn control system using proximity sensors. They proposed automatic vehicle horn control system in which, the vehicle horn will be disabled automatically unless the distance between two vehicles/objects

is minimum. Rosario et al[3] recognized the importance of automatic parking system and came up with an mobile application "Park Here!". In their work a mobile application was developed in order to ease the process of seeking parking slot. Chellaswamy et al[4] concentrated on pat holes and hump detection and developed an IoT based system for the safety of the vehicle. After studying the literature considering the road safety measure and to provide an automatic control system in a vehicle using IoT and cloud computing technology, the following objectives were set

- Automatically control the speed of vehicle based on the recommended speed limits of the road
- Automatically disable vehicle horn system in no horn zone by detecting such zone
- Automatically detect road humps ahead in specified distance and indicate it on vehicle dashboard
- Automatically indicate parking availability when vehicle approaches the parking area

## III. METHODOLOGY

The system is developed considering four applications of road safety for the automated vehicle namely

1. Speed control
2. No parking mode
3. Automated horn disable
4. Hump detection

The block diagram illustrating the various modules of this system is shown in Fig. 2. The first part is about web application management, here the database contains all the necessary information regarding speed limit, number of humps, no horn areas and no parking zone locations. Admin can login to the web page through credentials i.e. user ID and password. Using this web page, admin can create, update or delete the data base (based on information of sign boards). Whenever the vehicle enters to any particular zone, the current location of the vehicle and the necessary safety rules in that location is fetched by the cloud and the same information is given to the controller. Controller compares both fetched point and geo points and pass it on to the required block to perform necessary actions related to four applications.

**Speed control**: Whenever any vehicle move into the restricted areas that means it enters into the speed limiting area. Whenever it enters, the information about the current speed of that particular vehicle and the corresponding rules in that zone is received by the server and the same data is transferred to the controller, which in turn automatically reduces the speed of the motor[1][7].

**No parking mode**: The automatic parking system is developed. The server manages to store complete smart parking system information such as whether the place is allowed for parking or not[3].

**Automated horn disable**: whenever the vehicle enters the restricted zone, it just sends information that contains whether the vehicle is allowed to blow the horn inside the NO Horn area. Then the information is received by the Raspberry pi and the information is also given to the controller which in turns automatically disables the Horn of the vehicle until it leaves that restricted area[2].

**Hump detection**: The information is collected from the RTO administrator about the humps present in between the road and that information is stored in a cloud and later passed on to the controller, which gives a caution about the presence of humps on the vehicle dashboard [4][5].

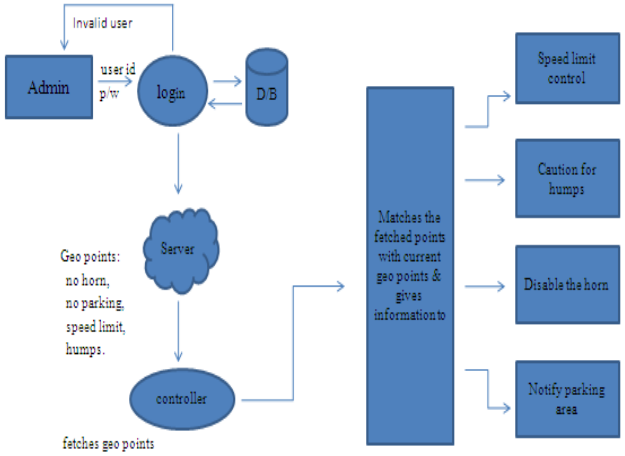


Fig.2 Block diagram of IoT and cloud computing based automated vehicle control system

The framework of Visual Studio is given in Fig 3. It is used in this system for the web page creation.


Fig.3 Visual Studio Framework

The Frame Work consists of website header and footer, navigation links and content of the page. The navigation links redirect to specific paths. The template is programmed in such a way that the only content of the page keeps changing according to particular navigation links whereas the header, footer and the navigation path remains the same.

A database is a distinct application that stores a group of data. A database is created to hold the information regarding the signboard category (speed limit, no horn, no parking, hump indication). Fig. 4 depicts the database fields and typical values set to develop automatic system for the four applications.

Latitude & Longitude Details

| Latitude | Longitude | Category | Value | Meter | Edit | Delete |
|---|---|---|---|---|---|---|
| 12.313152 | 76.615110 | Speed | 30 | 50 | Edit | Delete |
| 12.312691 | 76.614166 | NoParking | 0 | 50 | Edit | Delete |
| 12.312990 | 76.612820 | NoHorn | 0 | 20 | Edit | Delete |
| 12.313750 | 76.614043 | NoParking | 0 | 40 | Edit | Delete |

Fig.4 Database indicating fields and typical values

ADO.NET acts as an interface between web applications and server i.e., the data regarding 4 applications is fed/retrieved into/from server through ADO.NET framework.

In the hardware part, Raspberry Pi is used to retrieve the information from the server and to perform necessary action required (speed control, horn disable, hump detection and parking availability indication). Arduino is used to establish serial communication to display information on LCD. Two switches sw1 and sw2 are used. Switch sw1 is used to check the parking availability and switch sw2 is used as horn button. LED and buzzer are used as indicators in parking availability and horn disable applications. The speed variations are observed with connected DC geared motor. Initially the motor is set to high state. A GPS module is used to retrieve current location of the vehicle and the same information is given to the controller part. All these modules are integrated and connected to Raspberry pi.

## IV. RESULTS

The web page created to set measures and location information are depicted in the Fig. 5, Fig. 6 and Fig 7. The template required for road safety signage boards are designed using W3 layouts, which consists of in build templates in it and the necessary changes can be made according to the user applications as shown in Fig 5.


Fig.5 Webpage Template

After the template page is displayed, the login credentials should be given by the admin to access the web application page is shown in Fig 6.

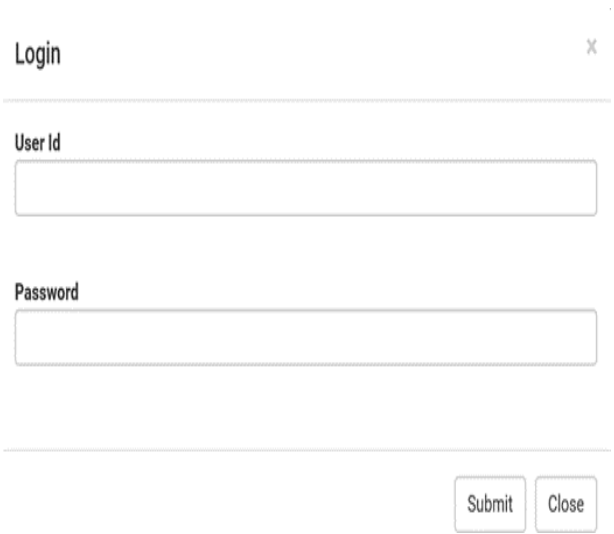


Fig.6 Admin Login Page

The admin can create, update and delete data using database page as shown in Fig 7. The location, latitude and longitude textboxes are used to give the information about the particular signage board location. The select category text box describes about the type of sign board installed i.e. speed, no parking, no horn and hump detection. The value textbox is used to set the speed limit of the particular location and for the other three applications, the value is set to zero. The range text box describes about the range of the sign board.

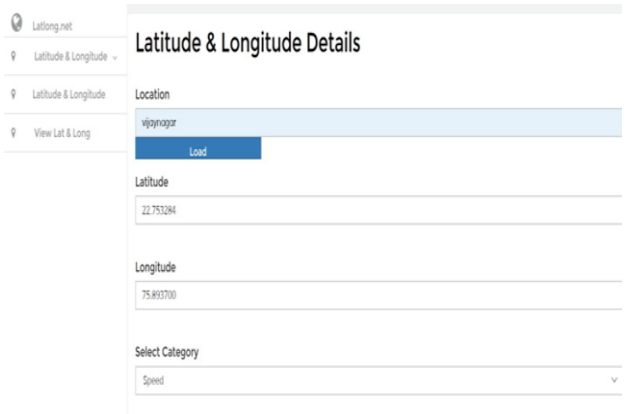


Fig.7 Signboard database creation page

Software and hardware model was integrated and the results were obtained for the four applications (speed control, horn disable, parking availability, hump indication). Fig. 8 depicts the integrated hardware model. Initially the motor was set at high state and the speed of the motor was reduced as soon as it entered into restricted area.

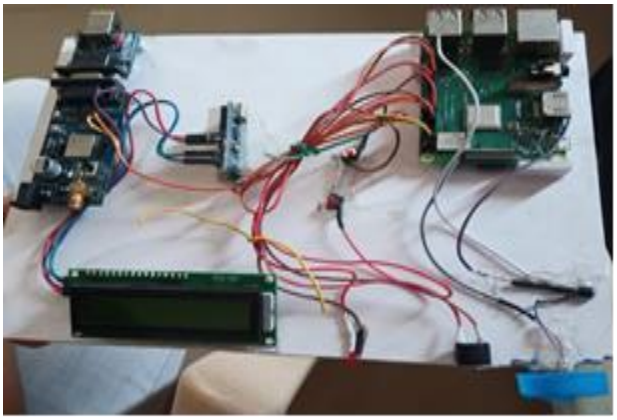

Fig.8 Integration of hardware module

The Led switched to off state, indicating that the vehicle can be parked into that particular location. Buzzer was disabled on entering the restricted area and indication of humps was achieved through the LCD.

## V. CONCLUSION

The vehicle control system was successfully developed with the set objectives. Performance analysis of the model was carried out under the supervision and the results of the four applications were satisfactory. Such systems are essential to reduce the number of accidents caused due to over speeding and negligence towards traffic rules. Hence it will improve our livelihood by controlling the traffic. Analyzing the need for automatic control system in a vehicle on the basis of road safety measures, this statistics can be used by the government to control the traffic and to avoid frequent accidents.

## REFERENCES

[1] Begum Korunur Engiz, Rakan Bashir. “Implementation of a Speed control system using arduino” Proceedings of 6th International Conference on Electrical and Electronics Engineering (ICEEE) 2019.

[2] Sai Krishna prasad P, S.Keerti, Parthiv T, Surendar S. “Automatic vehicle horn control system using proximity sensors”, International Journal of Pure and Applied Mathematics, Vol.118(20), pp-695-700, 2017.

[3] Rosario Salpietro, Luca Bedogni, Marco Di Felice, Luciano Bononi. “Park here! A smart parking system based on smartphones”, Proceedings of IEEE World Forum on Internet of Things, New york, Institute of Electrical and Electronics Engineers, pp- 18 – 23, 2015.

[4] Chellaswamy C, Anusuya T, Famitha H, Amirthavarshini S.B. “IoT based humps and pathole detection on road and information sharing”, Proceedings of International Conference on Computation of Power, Energy, Information and Communication 2018.

[5] A Santha Priya, S Saranya. “Automatic detection and notification of patholes and humps on road and to measure pressure of the tyre of the vehicle using Raspberry Pi”, International Journal of Scientific Research in Science, Engineering and Technology, Vol. 2(2) , 2016.

[6] Cem Bila, Fikret Sivrikaya, Manzoor A. Khan, Sachin Albayrak. “Vehicles of the future: A survey of research on safety issues.”, IEEE Transactions on Intelligent Transportation Systems, Vol. 18(5), 2017.

[7] Dr S.L Nalbalwar, Priyanka A Wagh, Rohit R Pawar. “Vehicle speed control and safety prototype using controller area network”, International Journal of Current Engineering and Scientific Research Vol.4(3), 2017.