An Intelligent Road Transportation System using IoT-A New Approach

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Abstract—*Road transportation keeps the very important part in the growth chart of any country especially in countries like India where the density of traffic is very high and traffic jams occur very often, so it becomes very important to manage the flow of traffic and make it congestion free and safe. One of the biggest issues we are facing in India in road transportation is the existing infrastructure, and it cannot be further modified, so the only solution is to intelligently manage the flow of traffic, because highly dense traffic may lead to slower the transportation speed which is not acceptable in case of working professionals who have to reach their destinations on or before time and it may even cause loss of human life in case of medical crisis and road accidental events. In our proposed idea we are trying to develop a system for connecting end users, vehicles and traffic junctions using IoT. The proposed system offers services mainly traffic flow management, detection of the alcoholic driver, real-time notification in case of emergency issues (accidental events, green corridor, traffic diversions etc), parking space notification and speed limitations at traffic junctions.*

1. INTRODUCTION

Intelligent Transportation System (ITS) [1] is an established route to resolve or minimize traffic problems. All ITS subsystems uses a traffic management [2] center where data is collected analyzed and combines with other operational and control concepts to manage the complicated transportation problems.

Vehicles waste 30 lakh liters fuel due to traffic jams which worth massive 10 crore rupees, and if these drivers can get the real-time information about the traffic condition of the roads, then serious traffic congestion can be minimized to the most. Another big problem is the accidents on the roads and they are happening due to problems like drink and drive, enforcing speed limits, breaking of signals etc. In an average, about 377 persons daily killed in road fatalities in India and most of them are because of delay in reaching emergency services.

2. OUR APPROACH

We proposed a new approach of Intelligent Road Transport System (IRTS) with an aim to evaluate, develop, analyze and integrate new sensors, information and communication technologies and concepts to achieve traffic efficiency, improve Environmental quality, save energy, conserve time and enhance safety and comfort for drivers, pedestrians, and other traffic groups. In this system, we are proposing a solution for these problems by installing technique like automatic notifying system for emergency services in case of emergencies and intelligent speed limiting solution.

Sometimes it takes too much time to find valid parking areas around our locations so we have proposed a parking indicator which will notify the driver about the valid parking areas around him. And it also includes energy efficient street lighting module to operate manually operated streetlights automatically which will reduce the waste of energy in street lighting by about 30 percent.

3. PROPOSED IMPLEMENTATION PROCESS

Intelligent Road Transportation System is not only required for congestion and demand management [3] but also for road safety and improved infrastructure. Intelligent Road Transportation System [4] consists of three main units:

4. VEHICLE CONTROL UNIT:

It will be microcontroller based unit having sensors/ detectors, GSM module, GPS etc. It is used to connect vehicle to vehicle and vehicle to the traffic junction unit wirelessly.

The vehicle control unit will receive the signals from the traffic junction and other infrastructure units installed either side of the road which is transmitted by the traffic junction & using GSM technology. The different features incorporated with sensors and technology [5] in this unit such as to enhance driver controls with SMS facility in case of emergency, it will also display route map with fuel station and speed details of particular route. [6]
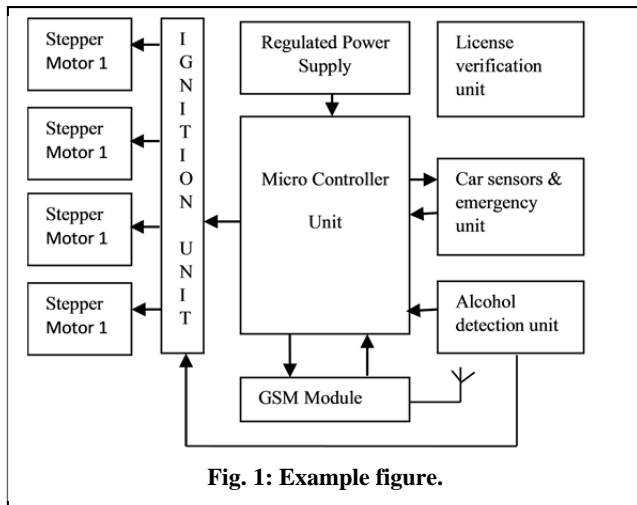
Fig. 1: Example figure.

5. TRAFFIC JUNCTION UNIT:

It will also be a microcontroller based unit acted as a traffic node in the traffic network installed at each traffic junction. It will be responsible for the communication between vehicle and traffic node with GSM technology. This unit will be comprises of microcontroller embedded with CCTV, detectors/ sensors on road or by roadside way and GSM module for communication purpose. It will acts as a node and collect the real-time information from the roads transmitted by the IR sensor mounted on the road to detect the activity of vehicle to limit the speed of vehicle by stepper motors. After that, the data will be transmitted by GSM module to the main traffic control room which further circulated some information to the end user over the mobile app as real time notification. Further this unit can be implemented with DSRC (Dedicated short range communication) and V2V communication. **[7]**
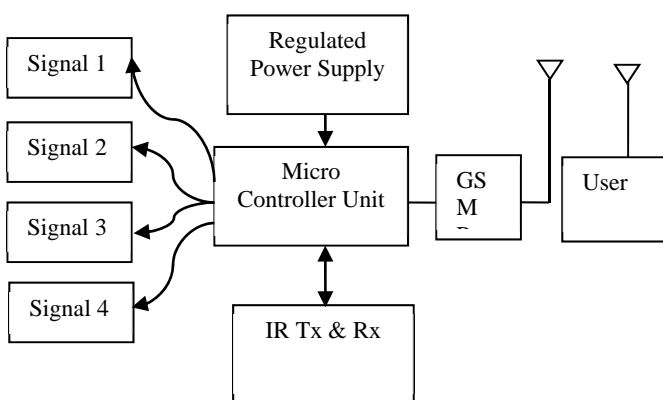

Fig. 2: Traffic Junction Unit

Mobile Application Unit: It will be a smart phone having a mobile application as a user interface. With this mobile application end

User will get connected with traffic network using credentials. The basic requirement would be the user details for the registration such as license number and vehicle information. Once the registration being done user will get the real-time updates transmitted by the traffic network such as traffic density route diversion, green corridor or emergency in case of accident took place and also using this applications some services like parking information, e-payment option for toll tax etc. will be available.
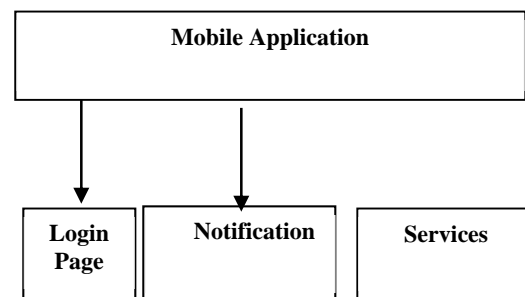

Fig. 3: Mobile Control Unit

6. IOT (INTERNET OF THINGS)

It is a very popular technology **[8]** nowadays and defined as internetworking of physical devices, vehicles, and other items embedded with electronics, softwares, sensors that enables these objects to collect and exchange data irrespective of time and distance. We proposed that using IoT all the three units will connect to each other wirelessly. I have shown the diagram of my proposed idea as –
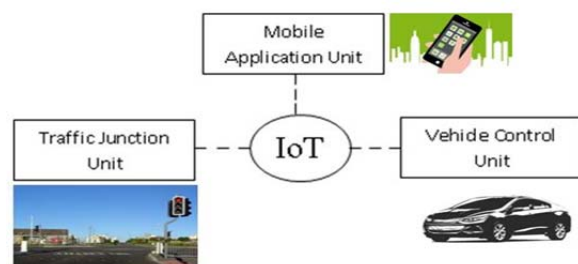
7. BENEFITS OF IRTS

- It will connect end users, vehicles and traffic junction using the connected devices by IoT.
- It will provide real-time traffic updates such as diversion route, accidental incidents & traffic density on mobile application.
- It will control the vehicle and enhance the driver control with SMS service.
- It will provide services to end-user like e-payment for toll tax, parking information.

- It can limit the speed of the vehicle.

- It will stop the issues of underage driving by using license reader.

8. ISSUES AND CHALLENGES

The rapidly advancing economy of India **[7]** has resulted in a phenomenal increase in the use of personal automobiles on Indian urban roads. Economy induced automobile usage is complicated further by the constant influx of rural population into urban areas, thus making an enormous demand on the transportation infrastructure in an overloaded region. We have highlighted the major issues facing the deployment of IRTS as underdeveloped road network with low spaces, limited budget, huge number of vehicles on road, deficiency of resources for maintenance and operation, low demand for automation, pending decisions from Government officials and awareness amongst local people. We have proposed some of the actions required to meet the challenges as follows-

- Setting up a national standard for different applications and components.

- Setting up a body or committee that takes care of the documentation of all the detailed projects.

- Setting up of fully functional traffic management system for coordinating urban and regional activities.

- Implementation of IRTS with some traffic protocols and adaptation of international standards with respect to the technology usage.

9. CONCLUSION

The rapidly increasing vehicle population in India which is resulted by the population growth and economic upturn lays a critical burden on traffic management on road. While India has started transport management intelligently more extensive and urgent integration of advanced technology and concept into mainstream traffic management is imperative. With our proposed system user, vehicle and traffic junctions will be connected all the time suing IoT concepts. IRTS is a new approach and it will offer services mainly traffic flow management, detection of the alcoholic driver, real-time notification in case of emergency issues (accidental events, green corridor, traffic diversions etc), parking space notification and speed limitations at traffic junctions.

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