Implementation of Critical Intimation System for Avoiding Accidents in Hairpin Curves & Foggy Areas

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Abstract

Negotiating a hairpin bend in a hilly track is not an easy task but demands a lot of skill, the drivers have to be agile at all times. Road safety is one of the main objectives on designing assistance system. Everyone nowadays needs to have a guarantee of safer transport. Among all fatal accident 95% are caused by human error. Thus by designing the accurate assistance system, rate of accident can be reduced. As computerized technology advances, there is a push towards Vehicle-to-Hub Communication. An accident avoidance system is one that gives safety to the vehicular system as well as to the driver and it reduces damage. Vehicle -to- Hub Communication can help to get it. The main motivation for car-to-car communication systems is safety and avoiding accidents due to collisions. The vehicle-to-Hub communication system is not designed for a particular brand or vehicle. This can be used in every vehicle with a little modification. The system is designed considering the normal car user can also use it. Automobiles have become one of the greatest commercial achievements of mankind in the past century but unfortunately during travel they are prone to accidents and become victims. Sensors take care of the location of the vehicles with respect to the hairpin bend to decide the priority in which vehicles have to move. Information exchange between vehicles regarding speed and distance is captured by the system and the decision based on algorithms is passed on to the vehicle by visual display. In this paper, we detail the hardware and software architecture designed and developed in the project.

Keywords: Fog Detection, IR Sensors, Road Safety Road Side Unit (RSU), Vehicle to Hub Communication (V2H)

I. INTRODUCTION

Nowadays, number of cars is increasing on road immeasurably. As a result road accident and traffic jam is a growing problem. Hence, research on improving road safety application is a subject of immense concentration. By communicating through wireless networks, safety application can be used to avoid accident.

In this network, communication can be done between various nodes like vehicle to hub (V2H) i.e. road side unit (RSU). To form the communication infrastructure there will be Road side unit (RSU) in multiple points of the road.

For example, in regions of Northern India (Uttarakhand), the traffic accidents are due to the poorly developed national highways, foggy areas, immediate bends, poor infrastructure and unattended hazard zones. In India, the rate of traffic accidents is increasing day by day, but traffic management and accident prevention knowledge is lagging far behind. Based on severity of accident, safe driving in the ghats section is chosen as the title of the paper which is felt should be given top priority as they have what we call “Hair-pin bends”.

It is clear while effectively tackling occurrence of accidents, all other factors can be minimized / eliminated by technology except the human factor which calls for a different approach and should be studied. Viewing in this perspective completing a task successfully is essentially decision making. Hence there is a model that considers man as an information processor. As viewed by ergonomists skill seems to lie largely in timing and coordination of activities to give smooth effortless performance.

In the case of road safety, vigilance task is of much importance. Based on our study and other studies, we suggest the following measures to minimize RTA in hilly roads. The planning of new road alignments on the hills, unstable land, slopes and cracked areas prone to landslide and washing away cannot be immediately averted hence the use of Critical Intimation System For Avoiding Accidents in Curves and Foggy Areas.

II. EXISTING SYSTEM

There is no current technology which is used to avoid the accidents in the hairpin bends and the foggy areas. Only convex lenses in the cars are used to see what is coming which is insufficient to avoid accidents in foggy areas and hairpin bends. We know that "Objects in the Mirror Are Closer Than They Appear"

Fig. 1: Convex Mirror

Fig. 2: Hairpin Bends

The pictures shown above are some of the existing techniques or the current measures to avoid accidents in hilly areas. As you can see the sign boards are the current measures to indicate the drivers about the curves and hairpin curves.

A. Advantages

Currently, there are no safety measures in hilly and foggy areas. There are only convex mirrors at the curves for the drivers to see which is not the most efficient way of handling the problem as the drivers couldn't make out the distance accurately & also in foggy areas the drivers couldn't see through the mirrors. Hence our proposed system can solve the above problem. The real-time handling of the problem is critical which is being handled in the proposed system.

B. Disadvantage

The additional hardware in the vehicles and overall maintenance of the system is required frequently. Though this system can handle most of problems faced in the hilly regions, the human negligence and ignorance can be handled only to an extent.

III. OBJECTIVES

This paper aims to reduce or completely eliminate the need of traffic signals at junctions in both heavily populated cities and smaller towns as they are often mismanaged and do not adapt to the various traffic conditions automatically. If it is manually controlled, it is not guaranteed that the controller is controlling it in the most efficient way. We are aiming to develop a model in which the system consist of modules Vehicle control in Weather affected Areas and hairpin bend: Virtual Antenna module measures Fog Presence using LDR in different areas and update the information to vehicle owners through RF module. The parameters such as vehicle speed and location is transmitted from a vehicle and received from another vehicle through RF transmitter and receiver.

The entire world is now facing the worst public health disaster it had witnessed, in the form of RTA (Road Traffic Accidents). The number of those killed in RTA annually is already very high and we are making the same mistake in managing RTA, as was done in managing major health problems. The commitment in developing countries like India towards road safety is very disappointing. By improving the visibility of drivers at night or during fog can reduce injuries hence our paper.

IV. LITERATURE SURVEY

A. *Vehicle to Vehicle Communication for Crash Avoidance System*

The Dramatic increase in the traffic flow raises demand on innovative technologies that can improve safety and efficiency of transportation systems. Road safety can be substantially enhanced by the deployment of wireless communication technologies for vehicular networks, which enable new services such as collision detection traffic management, and further communication facilities between moving vehicles.
Date Added to IEEE Xplore: 23 February 2017

B. *Optimization of Vehicle-to-Vehicle Frontal Crash Model based on Measured Data using Genetic Algorithm*

In this paper, a mathematical model for vehicle-to vehicle frontal crash is developed. The experimental data are taken from the National Highway Traffic Safety Administration (NHTSA).
Date of Publication: 23 February 2017

C. *Initial Steps toward a Cellular Vehicle-to-Everything Standard [Connected Vehicles]*

The Third Generation Partnership Project (3GPP) has developed some functionality to provide enhancements of cellular standards specifically for vehicular communications.
Date of Publication: 21 February 2017

D. *Vehicle Position & Context Detection using V2V Communication with Application to Pre-Crash Detection & Warning*

In recent years, there has been growing interest in the design of intelligent transportation systems (ITS) using vehicle-to-vehicle (V2V) and vehicle-to infrastructure (V2I) communication technologies.
Date of Conference: 6-9 Dec. 2016

E. *Dynamic Proximity-Aware Resource Allocation in Vehicle-to-Vehicle (V2V) Communications*

In this paper, a novel proximity and load-aware resource allocation for vehicle-to vehicle (V2V) communication is proposed. The proposed approach exploits the spatio-temporal traffic patterns, in terms of load and vehicles' physical proximity, to minimize the total network cost which captures the tradeoffs between load (i.e., service delay) and successful transmissions while satisfying vehicles' quality-of service (QoS) requirements.
Date Added to IEEE Xplore: 09 February 2017

V. METHODOLOGY

In this section, we proposed an algorithm to avoid accident and to prevent congestion in hilly areas and hairpin bends. In our proposed approach, intimation will transmit faster; hence it will be helpful for vehicles to avoid collision and also for controlling traffic congestion. A scenario for the proposed approach that shown in Fig. is described as follows: Assume that, there is one RSU (Road side unit) in each intersection of the road and they are connected by ZigBee for faster communications to vehicle communication will be always wireless, again via ZigBee. For vehicle to vehicle communication each vehicle will have one Vehicle unit (VU) attached to it that is capable of sending and receiving message. One VU can communicate with its nearest Hub. RSU is capable of sending message to the VU via Hub with the help of ZigBee within its coverage area. We have divided whole process in two parts one is communication process to avoid accident and process to congestion control.

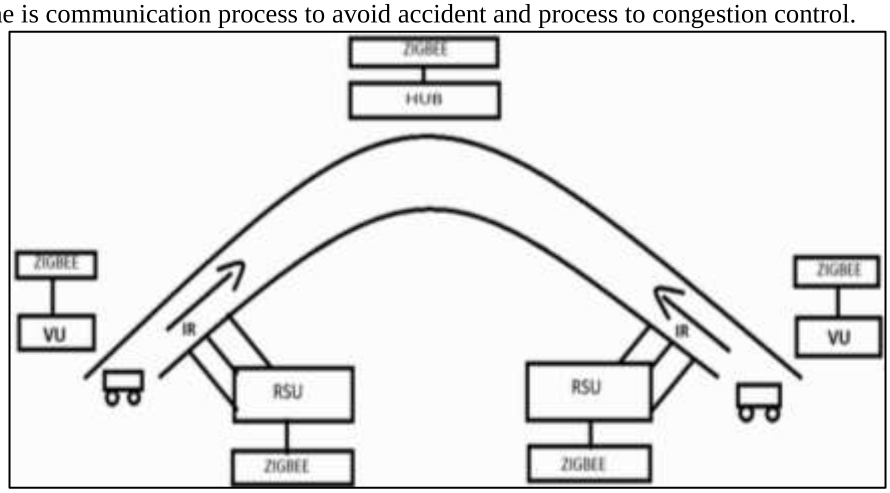

Fig. 3: Block Diagram of the Proposed System

A. Working

We know that there are two IR sensors on both sides of the hairpin curves. These IR sensors are used to calculate the speed of the car which helps in deciding the priority. Now, consider a vehicle passing the first IR sensor on say, road 1 and another vehicle passing the first IR sensor on road 2. The timer 1 starts as soon as the vehicles pass first IR sensor on road 1 and similarly timer 2 starts as soon as the vehicles pass first IR sensor on road 2. Now whenever any vehicle passes the 2nd IR sensor, the timer stops and the priority is decided as to which vehicle can cross the curve first depending on the speed of the vehicles. That is vehicle approaching the curve faster will get the preference to cross the curve first. If both the vehicles are approaching the curve at same speed, a default priority is assigned to the vehicle on the road which is on the edge of the hilly curve.

VI. APPLICATIONS

The proposed system takes care of all likelihood combination of vehicle movement parameters and human factors which culminate into an accident. By installing this system, in case of accident, information is passed onto the authorities like police, hospital, RTO, relatives, repair and hauling workshops Based on our study and other studies, we suggest the following measures to minimize RTA in hilly roads. The planning of new road alignments on the hills, unstable land, slopes and cracked areas prone to landslide and washing away cannot be immediately averted hence the use of Critical Intimation System For Avoiding Accidents in Curves and Foggy Areas.

VII. MODEL

Fig. 4: Model of the Proposed System

VIII. CONCLUSION

The above proposed system overcomes the problems of negotiating weather affected and hairpin bend in the hilly track. The system has to be implemented in all the vehicles in the real time covering the above mentioned concepts. The module was implemented in two small smart cars. Based on the concepts mentioned the following were done. Priority in bend: based on the factors such as vehicle type, speed and distance a total of combinations has been identified and implemented in the coding. In future, we can add the voice message instead of just LCD display.

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