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Cybernetic Organism for Locomotion towards Paradigm

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ABSTRACT

Auto collisions have been taking a great many lives every year, dwarfing any savage ailments or cataclysmic events. Studies demonstrate that about 60% roadway crashes could be kept away from if the vehicle's driver had been given cautioning at any rate one-half second before an impact. Human drivers experience the ill effects of recognition confinements on roadway crisis occasions, bringing about enormous postponement in spreading crisis alerts. Safety on the road is one of the key main impetuses behind the advancement, improvement, institutionalization and execution of ITS frameworks. Proposed system uses VANET Standards (VANET is a Mobile Ad-hoc Network (MANET)'s sibling which can organize its own communication model without any other infrastructure dependence). In this project, considering the different features and the cost, on a small scale a four- wheel vehicular robotic prototype has been designed that will follow the lane and avoid obstacles.

Keywords: Ad-hoc, VANET, MANET, Obstacles.

I. INTRODUCTION

Our implementations begins by describing the landscape and key players in the self-driving car market. Current capabilities, as well as limitation and opportunities of key enabling technologies, are reviewed, along with a discussion on the impact of such advances on society and the environment. Most impact, including reduced traffic and parking congestion, independent mobility for poor people, increased safety, and energy conservation and pollution reductions will only be significant when autonomous vehicles become common and affordable to common people. Various images are captured by the camera module, on this images various Image processing techniques are used to achieve desired functionality of the proposed system [3]. Auto collisions have been taking a great many lives every year, dwarfing any savage ailments or cataclysmic events. Studies demonstrate that about 60% roadway crashes could be kept away from if the vehicle's driver had been given cautioning at any rate one-half second before an impact. Human drivers experience the ill effects of recognition confinements on roadway crisis occasions, bringing about enormous postponement in spreading crisis alerts.

VANET is a Mobile Ad-hoc Network (MANET)'s sibling which can organise its own communication model without any other infrastructure dependence. VANET provides a number of facilities, but the most significant of all is the roadway safety services to reduce crashes by exchanging information via the web. In VANET, V2V and V2I are two types of interaction [7]. Rushing around, trying to get errands done, thinking about the things to be bought from

the nearest grocery store has become a part of our daily schedule. Driver error is one of the most common cause of traffic accidents, and with cell phones, in- car entertainment systems, more traffic and more complicated road systems, it isn't likely to go away. All of this could come to an end with self-driving cars which just need to know the destination and then let the passengers continue with their work. This will avoid not only accidents but also bring a self-relief for minor day to day driving activities for small items[9].

Safety issues in transportation are one of the fundamental concerns, getting more interest with enthusiasm from both society and research networks. In the ITS field, VANETs rise as an effective answer for accomplishing safety and effectiveness in rush hour gridlock road ways. Late endeavours have tended to make safety related applications with the objective of diminishing or wiping out the likelihood of auto collisions in vehicular conditions. One of the applicable solutions in this field is launching emergency alerts.

II. PROBLEM STATEMENT

To reduce the an amount of burden on the drivers/owners of the cars who tend to face lot of issues when driving through such conditions and alerting them so that they will be extra cautious about his/her surrounding in the traffic or normal city conditions.

III. AIMS AND OBJECTIVE

The objective of our work is decreasing the likelihood of auto collisions utilising the vehicular correspondence. This project work involves structuring, designing and deploying an Android-based application giving the geographical data of significant close-by vehicles along with critical alerts passage between the connected vehicles, providing voice alerts to the drivers with automated cautioning alerts delivery based on obstacle detection. This application also sends out the warning messages triggered automatically for a very close proximity or manually initiated though push- button by the drivers of the vehicles.

This application has three components, a vehicle On Board Unit (OBU), dashboard app and a RSU, which talk to each other as part of warning message communication. OBU is a hardware module consisting of sensors, controlling micro-controller and communication unit. Dashboard app acts as an interface for the vehicle's driver to through which on road vehicle safety assistance is provided. RSU connects the vehicles in a small area in its neighbourhood and accesses central database of vehicle where safety alerts are stored. RSU can also work as an access point for moving vehicles in that proximity.

Also, project focuses on the major safety systems in vehicular transport systems. Such a system not been implemented any before in the automobile industry yet. There are some systems in the same working manner but they need Human Intervention in some of the areas. Our project's main aim isn't the self or automotive driving car rather than different working conditions of the safety systems embedded with the self-driving car. The project also deals with the cost and energy efficiency standards which are the main aspects of any project is concerned.

We have to achieve the following objectives-

- Complete Driver Alerting System through the interface of Android App.
- Autonomously Driving Car .
- To detect the right signals and dynamically change the state of motion.
- To alert the front and rear people with the alerting system.

- To design an portable hardware that can help in detecting multiple parameters with respect to the driver.

IV. RELATED WORKS

In [1], published by Johann Borenstein & Yoram Koren, a, 2013 In VANET, essentially the correspondence is happening with the moving nodes as vehicles thus, vehicles to set-up a direct link between them with the assistance of single hop, which is connected with the predetermined zone of inclusion due to the varying speeds of vehicles and instant movement of paths without any warning is the primary issue in Vehicular communication.

In [2], published by Yue Wanga, Eam Khwang Teoha & Dinggang Shenb. research on a position-based routing approach which was geographic (GSR) that utilises the navigational frameworks of vehicles. Besides, different works have explored the performance of range detecting in VANET over various fading model is embraced.

In [3], H. Dahlkamp, A. Kaehler, D. Stavens, S. Thrun, and G. Bradski, Obstacle Avoidance with Ultrasonic Sensors, IEEE JOURNAL OF ROBOTICS AND AUTOMATION had made a concept of car which used the ultrasonic sensors to detect the obstacles around it and notify/act accordingly.

In [4], published by Joel C. McCall &Mohan M. Trivedi, Lane detection and tracking using B- Snake, Image and Vision Computing 22 (2004) , is a platform built by the author using B-Snake technique to detect the lane in which the vehicle has to travel around using the vision computing technology.

In [5], published by Tushar Wankhade & Pranav Shriwas, Driver Assistance System based on Raspberry Pi, in this approach the author came with the solution to help the drivers with an assistance based system which works with the help of micro-controller i.e Raspberry Pi and tracks the various records of the users/driver and guide him according to the situation.

In [6], Specifically, when incorporating security-related apps with Android-based smartphones, writers such as Whipple et al. suggested using an Android app to notify passing by drivers about the velocity restriction in a college region. This Android Public Safety implementation utilises the GPS function to find the vehicle's position and then utilises the Google Maps API to identify the position of neighbouring colleges. If the rider exceeds the limit on the speed threshold in a school region, an alert will be sent by this application.

In [7], the Narathip Thongpan, & Mahasak Ketcham, Video-Based Lane Estimation and Tracking for Driver Assistance: Survey, System, and Evaluation, IEEE Transactions on Intelligent Transportation Systems, came out with an solution for detecting and estimating the lane of the road which is being extracted by the video-based estimation and tracking.

V. PROPOSED METHOD

Proposed system is an automated alerting and driving system using IOT, Image Processing and Machine Learning. As part of this project Android based dashboard app is prototyped along with an obstacle and human sensor hardware equipped as OBU to sense very near-by vehicles, obstacles and humans within a certain range of the vehicle. This prototype works on the basis of Wi-Fi-direct technology and cautions the driver of the vehicle with voice alert about the obstacles. It enables the user to send push-button alert to the neighboring vehicle in case of

emergency, so this app works as a driver assistance and safety tool for the vehicle.

Our proposed system has the following advantages.

- High Accuracy
- Low Latency
- Works Offline
- Works efficiently with needing extra power to run.

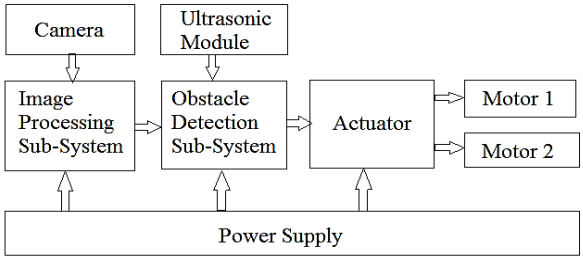

Figure 5.1: Block Diagram

VI. METHODOLOGY

It is a detailed study of the various operations performed by a system and their relationships within and outside of the system.

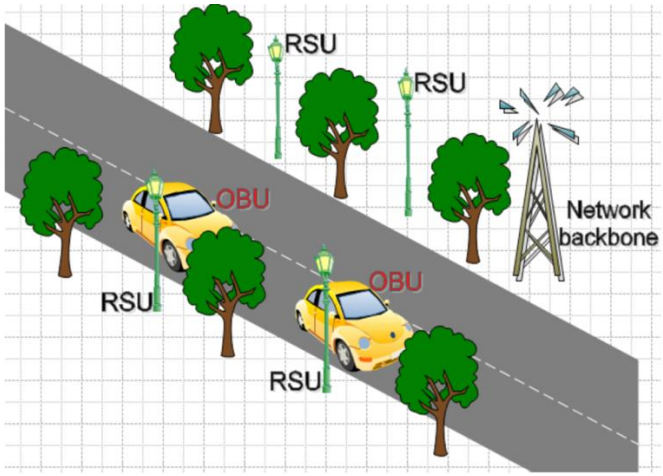

Figure VI.I : Illustration of Intelligent Transport With OBU and RSU

- Initially we need to install all the sensors and interface them with Raspberry pi model 3 b+ and Arduino respectively and they act as main MCUs.
- When vehicles and other objects are detected by Ultra Sonic and PIR sensors then the user/driver will be alerted by the simple android App being built.
- If faults are detected with the help of LDR and current sensors then messages are sent with the exception handlers saying no worries and good to move.
- Then we can interface multiple use cases with the project such as Driver drowsiness detection, Alcohol Detection, HIT and RUN cases, etc.

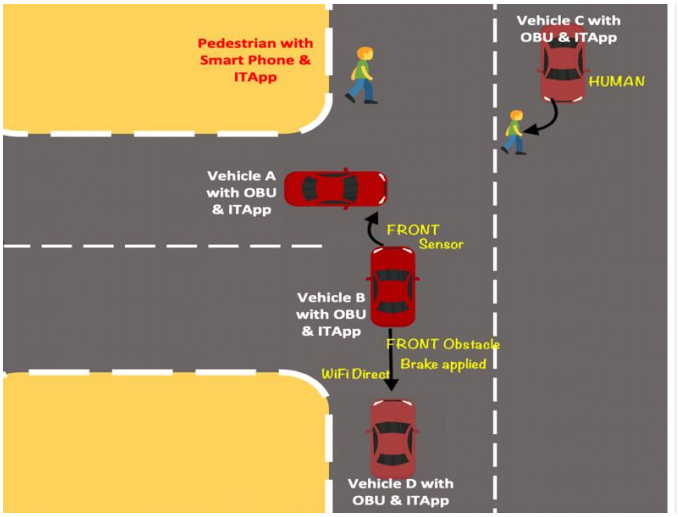

Figure VI.II : Illustration of Intelligent Transport App Usage

- For now all the functionalities are being depicted through a prototype being built and demonstrated.
- The vehicles front and back are also being alerted with the public release of the application being built with the project.
- The number plate of the person who hits the car in either of the direction's picture with the vehicle's picture is being captured in the DB so that it can be used to find the culprit red handed without seeking the help of any kind of officials
- The vehicle being prototyped also checks for the person if he is normal or is sleepy during the

course of driving in the middle of the road, If sleepy it will alert him until he wake up, If not responded then the vehicle will be halted within the safest distance from the other passer by vehicles.

VII. RESULTS

Assembled OBU hardware looks like the one shown in figure 6.1(a). OBU is powered on and ready to be connected to ITA app show in figure 6.1(b). ITA app launched - Welcome screen is rendered as in figure 6.1(c). App takes the user to Login screen - refer figure 6.1(d). Vehicular/pedestrian user logged to the ITA app and main screen is rendered as in figure 6.1(e). Let us name this vehicle as My Vehicle. App is connected to OBU by pressing Connect button

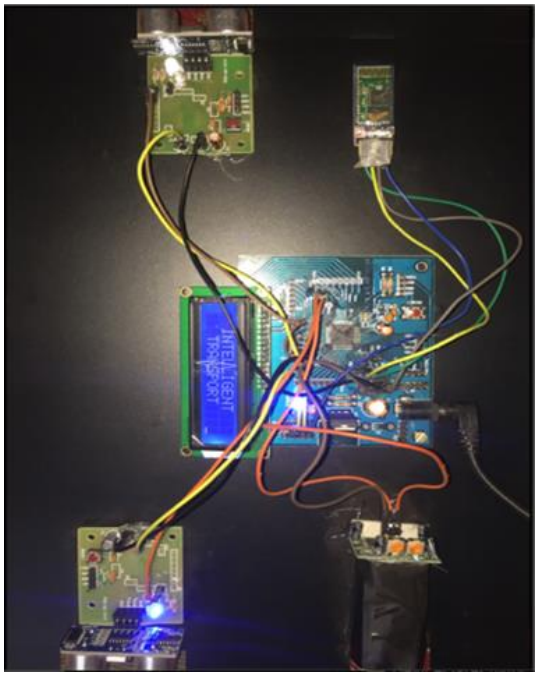

Figure VI.III : Illustration of Intelligent Transport App Usage

VIII. CONCLUSION AND FUTURE SCOPE

The proposed road safety system prototype is devised to assist drivers and pedestrians by cautioning them with necessary alert messages based on the emergency situation. This application works as a collision avoidance tool for vehicles and designed using a novel method of vehicular communication - WFD. Rather than using DSRC, a conventional vehicular

communication technology, WFD has been utilized to help and avoid extra hardware for pedestrians and two-wheeler riders. The ITA app is usable on Android mobile devices and android supported vehicle dashboards so that can be easily deployed.

The proposed prototype's scope was to provide necessary warning commands/messages to the vehicle administrators so as to alert him on the possible emergency situation. The scope can be extended to make it as a product with more powerful sensors and tested on a real-time moving vehicles. The collision avoidance triggers can be utilized as commands to control the vehicle by integrating these commands from V2V interaction with Controller Area Network(CAN) protocol messages. This would make our collision alert system to automatic collision averting system.

The heading of the References section must not be numbered. All reference items must be in 10 pt font. Please use Regular and Italic styles to distinguish different fields as shown in the References section. Number the reference items consecutively in square brackets (e.g. [1]).

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