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Secured Vehicular Systems Using Wireless Sensor Networks

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ABSTRACT: Automotive telemetric is the newly explored technology basically deals with the services provided to vehicles by deploying a telecommunication control unit. Intelligent vehicles exchange real-time data among vehicles, between the vehicles and roadside units attached to the infrastructure. The main goal of this project is to increase the road safety by reducing the number of accidents and increasing traffic efficiency with traffic congestion control resulting in reduced transport time. It includes some additional features like pre-crash, emergency braking, traffic jam, slippery road or construction zone warnings, green light optimal speed advisory, vehicular intersection alert system, road speed limit warning and emergency vehicle warning. The infotainment services offers comfort to driver and passengers. The system includes three units which are communicated through the wireless network protocol. The system includes one control unit with touch screen display, sensors and transceiver and two vehicle units which includes LCD, sensors, transceiver and buzzer. This technology, therefore offers new solutions not only for proactive safety and accident prevention but also for intelligent energy management.

KEYWORDS: Inter Integrated Circuit (I2C), Vehicular Ad Hoc Network (VANET) , Vehicle to vehicle(V- V), Vehicle to infrastructure(V-I) communications

I. INTRODUCTION

Now-a-days vehicles are equipped with driver assistance systems with sensors and cameras. The new technology of co-operative Intelligent Transport Systems and Services (C-ITS) enables communication between vehicles and traffic infrastructure. It is based on the principle that cooperative parties (ITS stations, i.e. in vehicles, road side units) exchanging information among each other in terms of standardized messages. The receiving ITS station analyses the incoming data and makes use of them, resulting in a self-organization principle on local level. Services and applications being subject to cover up-to-date traffic information, improved road safety by avoiding accidents and reducing injury severity, increased efficiency by supporting a consistent traffic flow, foresighted driving and enhanced driving comfort.

Providing safety is the primary objective of vehicular communication networks. Intelligent transport systems based on wireless communication will play a key role in the development of new advanced driver assistance System. The main aim of the project is to provide innovative services relating to different modes of transport and traffic management which enables various users to be better informed and makes safer, more coordinated, and 'smarter' use of transport networks. Roadside units can provide information to the drivers which help them in controlling the vehicle. Vehicle to vehicle(V- V) and Vehicle to infrastructure(V-I)communications require highly reliable and secure data exchange between fast moving vehicles and infrastructure from rural highway to dense urban canyons.

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The system includes the features like forward hazard warning, Green light optimal signal, the intersection Assistant analyses Emergency Vehicle Warning. The warning comes with information to approaching vehicle in case of an accident or road works to the end of a tailback. Traffic lights can supply information about their phasing, so that drivers can choose an optimal speed for catching lights on green or warned in sufficient time to avoid any risk of going through a light on red. The intersection Assistant analyses the incoming information about the distance from the intersection and direction of travel of other road users, along with information generated by the drivers own vehicle. Road speed limit warning:

The application allows connected vehicles to receive information that is approaching a road along with recommended speed for the curve. This capability allows the vehicle to provide a warning to the driver regarding the road and its recommended speed. Early warning of an emergency vehicle is provided.

Basically, in the existing system only the information regarding intersection of vehicles is received from their local sensors, which are primarily Sonar, Radar, or Camera. For providing safety transport system this is insufficient. Sensing is restricted to the line of sight, leaving out hidden and not recognized but possibly relevant vehicles or other obstacles. In a Vehicular Ad Hoc Network (VANET), the wireless Collision Avoidance issues warnings to drivers before they reach a potentially dangerous zone on the road. A dichotomized headway model, the braking model, and Greenberg's logarithmic model is utilized to generate vehicular mobility traces for analysis. [1] The average number of collisions that occur in the platoon, the probabilities of the different ways in which the collisions may take place as well as other statistics of interest is computed. [4] Car-to-car communication analysis and investigating the influence of beacon generation rate with beacons containing speed, direction and position of a car is extremely important. [5]

II. MATERIALS AND METHODOLOGY

This model provides communication between vehicles for safer transportation system. The vehicles are associated with a micro controller based module which has various sensors associated in order to control the system. The crash sensor senses the vibration of the vehicle and measures it periodically if the acceleration of the vehicle goes beyond the threshold level it senses and sends a signal to microcontroller. This helps to detect the accident when a vehicle hits on any object. The microcontroller after receiving the signal sends an alert message to other vehicles regarding the crash. It gives information regarding the accident to the other vehicles in order to avoid congestion at that spot.

The direction sensor senses direction of the vehicles moving in opposite direction. Also the angle between two moving vehicles is measured. If it is 90° , then alert message to vehicles are given to avoid intersection and the distance at which the vehicles approach is also displayed over the display. This avoids intersection of two vehicles leading to accident. At the traffic signal, the color of the signal light is sensed and if it is red then the engine motor gets off in order to save fuel. This can be achieved by placing a microcontroller at traffic signal which passes the signal information to the vehicles at the signal by wireless transceiver. In case, an emergency vehicle passes an alert message is given to vehicles and if suppose a particular vehicle does not leave the way for emergency vehicle to pass through then that particular vehicle is noted and reported to control room.

The Microchip MIWI P2P Wireless Protocol is a variation of IEEE 802.15.4, using Microchip's 2.4 GHz transceiver and any Microchip 8, 16 or 32-bit microcontroller with a Inter Integrated Circuit (I2C). The protocol provides reliable direct wireless communication via an easy-to-use programming interface. Based on the MRF24J40 chip, this module gives you everything need to start immediate work on developing IEEE 802.15.4 (WPAN). WPAN makes it very easy to communicate, providing addressing, automatic retry and most importantly, collision detection and avoidance. The result is a very robust, high speed data connection as shown in figure 1.

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When acceleration is applied to the sensor the proof mass displaces from its nominal position, causing an imbalance in the capacitive half-bridge. This imbalance is measured using charge integration in response to a voltage pulse applied to the sense capacitor. At steady state the nominal value of the capacitors are few pF and when acceleration is applied the maximum variation of the capacitive load is in RF range. Speed control sensor is used to increase or decrease the speed of the vehicle. Potentiometer is used as speed control sensor.

A potentiometer is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider. It is an electric circuit in which the resistance can be changed manually by the sliding contacts. If only two terminals are used, it acts as a variable resistor or rheostat. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment, speed control in vehicle. Potentiometers operated by a mechanism can be used as position transducers. Potentiometers are widely used as user controls, and may control a very wide variety of equipment functions.

Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

The touch screen enables the user to interact directly with what is displayed, rather than using a mouse, touchpad, or any other intermediate device. Touch screen is more reliable and hence proper touch panel design can make the keyboard

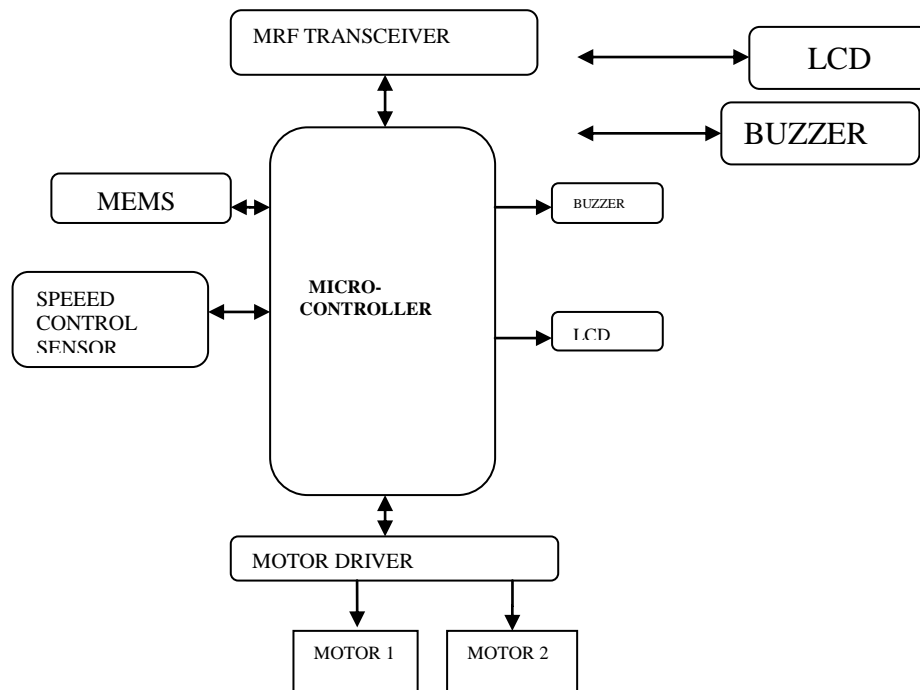


Fig. 1 Hardware unit of the system

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III. SOFTWARE PARAMETERS

All The software parameters are used in this system for processing and coordinating with the hardware components to execute the operation. All the received information from the input device is processed under a Microcontroller with various functions to provide the desired output. The LPC Xpresso will provide software engineers a quick and easy way to develop their applications. LPC Xpresso is a new, low-cost development platform available from NXP. The LPC Xpresso IDE can build an executable of any size with full code optimization

IV. RESULT AND DISCUSSION

The output model for the traffic signal application is shown below in figure 2.



Fig. 2 Hardware model of traffic system

The model of the vehicular system is shown below in figure 3. This system implementation primarily focuses on allowing simultaneously vehicle users to communicate without any interference. It enables various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks

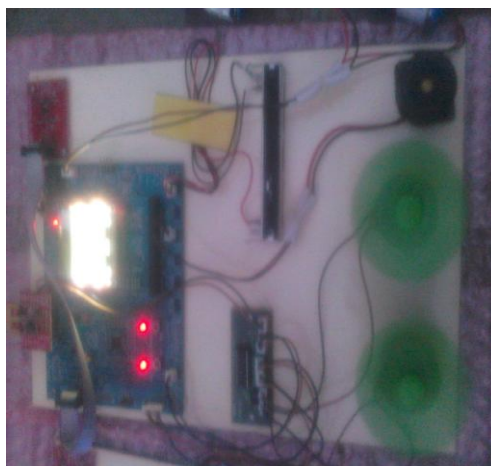


Fig. [4] Hardware model of vehicle system

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V. CONCLUSIONS

. Roadside units can also provide information to the drivers which help them in controlling the vehicle. V2V and V2I communications require highly vehicle users to communicate position and their locations are sent to its parent and control room. This project can be extended in many ways like adding additional features such as toll-gate collecting, parking assistance. Road signs can also be recognized and detected and given as a voice signal to the drivers.

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