



Car-Connect: Car-2-X Communication System integrating Vehicles and Road Traffic Units for Intelligent Transport System of Future

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Abstract

In this paper, we will be highlighting the use of Adhoc wireless communication system based on Radio Frequency Identification technology in car connect, that is to provide a communication between each vehicles and road traffic units for safety purposes. The scheme proposes an efficient way for avoiding road accident that occurs in modern cities which sometime cause fatal. Many road accidents are due to high speed and intersection collision, this scheme will provide an efficient way to alert the driver regarding the lane condition, speed limit, traffic jam and many other necessary information such as forward hazard warning and emergency vehicle warning.

Keywords: RFID, Adhoc wireless network, control and monitoring unit, vehicle unit

1. INTRODUCTION

Car-2-X (C2X) is an automobile technology designed to allow vehicles to "talk" to each other. The exchange of real-time data among vehicles and between vehicles and roadside units attached to the traffic infrastructure contributes to traffic safety and sustainability. RFID system includes tags and readers. RFID tags are deployed on roads whereas RFID readers are installed on vehicles. Using of RFID technology on road for allowing vehicles to communicate to each other as well as the road side traffic units and exchanging information in future transportation system will considerably reduce traffic congestion and minimize road accident. The advantage of car connect using Adhoc wireless network based on RFID system is that it provides real time information exchange.

2. SCOPE AND OBJECTIVES

The main goal is to design a Car-2-X communication system using an Adhoc wireless network that would demonstrate the usefulness of this technology which would be applied for:

- Advanced driver assistance increasing road safety by reducing the number of accidents as well as reducing the impact in case of non-avoidable accidents.
- Increasing traffic efficiency with traffic congestion control resulting in reduced transport time, fuel consumption and thus contributing to improving the environment.
- User communications and information services offering comfort and business applications to driver and passengers

There are several use cases where car-2-x technology would be applied in a real world such as:

2.1 Forward Hazard Warning:

If a vehicle is approaching an incident such as emergency braking, accident, traffic jam, slippery road, or construction zone, it collects this information and broadcast it to all vehicles in the surrounding alerting the driver what comes ahead. When a vehicle receive this kind of information it

retransmitted to another vehicle in its close vicinity using the radio frequency transceiver.

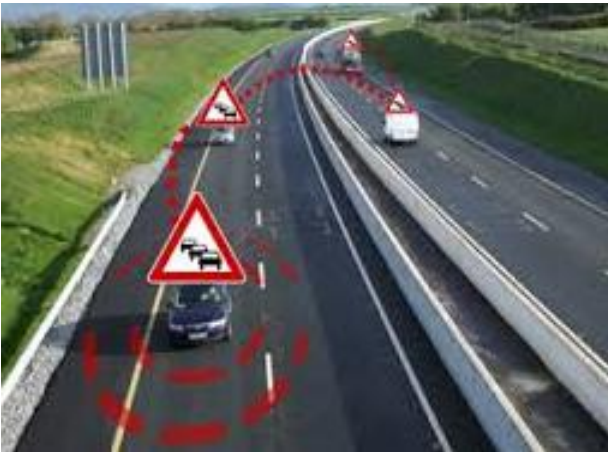


Fig.1 vehicle transmitting information to other vehicle

2.2. Green Light Optimal Speed Advisory:

The vehicle approaches the traffic light that is currently red. Based on the received traffic light phase schedule, the vehicle calculates an approaching speed of say, 45 km/h, at which the vehicle would reach the traffic light at the beginning of the next green phase. This information is presented to the driver who can avoid the unnecessary stop. If the vehicle is somehow needed to stop, then the traffic light would automatically switches off the car engine and later switch ON the ignition once it shows green.



Fig.2 vehicles and traffic unit exchange information

2.3 Intersection collision warning:

While a vehicle is moving on a road approaching towards an intersection point or is running along a curve road, at the same time another vehicle is approaching it from the other side of the road, and due to some reason such as view obstruction the driver is not aware of an approaching vehicle moving towards it. In such cases, the driver receives a warning that there is another vehicle approaching from the other side of the road.



Fig.3 vehicles approaching in curve road

2. PROPOSED METHODOLOGY

The project aims to design a vehicular communication with road side units. The control and monitoring units have touchscreen display and other sensors. Vehicle units have a compass, a graphics LCD and a warning buzzer.[1]

The system consists of the following components:

- *Microcontroller*: 32-bit ARM Cortex-M3 microcontroller, LPC1300.
- *IEEE 802.15.4*: wireless network protocol used to communicate between all the three units
- *Touch screen Display*: A color touch screen TFT display with QVGA resolution is used as the main HMI for the project demonstration
- *Graphics LCD*: used to show the vehicle status and other info to the driver
- *MEMS Compass*: used to find the direction of the moving vehicle
- *MEMS Accelerometer*: used to sense accident situation

- *Brake Position Sensor*: used to sense emergency braking situation.
- *Vehicle Speed Control Sensor*: used to increase or decrease the speed of the vehicle
- *Buzzer*: used to provide warning sound to the driver
- *DC Motor*: used to emulate a running vehicle driven by a motor driver circuitry
- *Battery*: used to power all the electronics and motors in the project

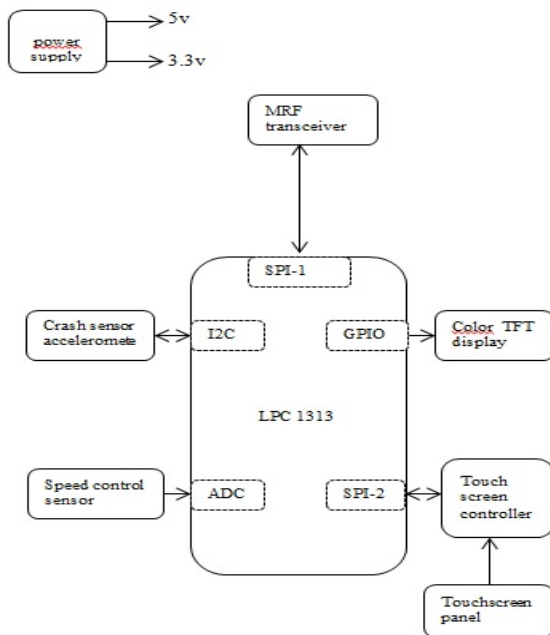


Fig.4 Control and Monitoring unit

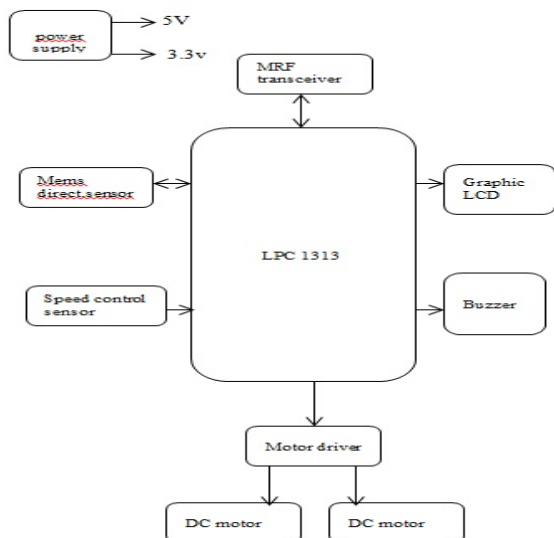


Fig.5 vehicle unit

4. CONCLUSION

In this paper, we have represented a method for helping the drivers and provide an efficient way to control and monitor vehicles on road using adhoc wireless communication. This method is efficient and the required components are easily available at low cost and yet it performs an important task to vehicles on road. This method guarantee safety on road and would reduce traffic accident by providing necessary information to the driver and allowing the vehicles to communicate with each other and road traffic units that are installed on road side.

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