



---

## ROAD ADAPTIVE OVERTAKE ASSISTANT SYSTEM BASED ON DEDICATED SHORT RANGE COMMUNICATION

**S. SENTHAZHAI**

Assistant Professor, Department of ECE, Krishnasamy College of Engg. &Tech.,

**A.VAISHNAVI**

Krishnasamy College of Engg. &Tech, Cuddalore

### **ABSTRACT**

Dedicated Short Range Communication (DSRC) is an emerging technology that allows vehicles to communicate with each other. The rear-end collision warning system based on DSRC has its unique advantages. This paper consists of three units such as the control unit, monitoring unit, and vehicle units which are based on a wireless network. The ARM CORTEX M3 microcontroller is used for controlling all the operations. It can be implemented in five cases such as Forward hazard warning, Traffic light timing display, Intersection collision warning, Road speed limit warning and Emergency vehicle warning.

Index terms- Dedicated Short Range Communication (DSRC), IEEE 802.15.4

---

### **I. INTRODUCTION**

A statistical report points out that rear end collisions are most common in traffic accidents and are the cause of most traffic injuries. The major cause for accidents is due to rear end collisions, driver distraction and following the vehicle too closely. RADAR and LIDAR systems are adopted as the ranging sensor to detect the rear end of a vehicle in front of the equipped car. LIDAR based systems does not work robustly on bad weather. This can cause complications on twisting paths.

DSRC is dedicated to the communication to enable vehicles to exchange their movement information and track each other's trajectory. The quality of the wireless

communication through DSRC, which is not affected by adverse weather or illumination, ensures the applicability of the system. In addition, DSRC-based technology can achieve long-distance perception between vehicles. This is important due to the fact that, in some cases, warnings should be issued with hundreds of meters of headway distance to keep safety and attain a comfortable drive.

Dedicated short-range communication (DSRC) has been used in prototyped vehicles to test vehicle-to vehicle communication for collision avoidance. However there is little study on how collision avoidance software should behave to mitigate accident collisions. The warning strategies for collision avoidance are constrained by the timing of events such as DSRC communication latency, detection range, road condition, and driver reaction and

deceleration rate. With these events, we define two collision avoidance timings: critical time to avoid collision and preferred time to avoid collision, and they dictate the design of software-based collision avoidance systems.

In this paper, we use information from a prototyped DSRC-based collision detection system, and we take into account different timing factors that affect collision avoidance, factors such as driver reaction time, braking time and road conditions. With this information, we study how they can be used in a collision avoidance warning system, employing a DSRC device that could detect surrounding vehicles for computing vehicle trajectories.

The results of this study illustrate the critical timing zones when advanced warnings must be given to effectively avoid collision in different accident scenarios. From these critical timing zones, we have devised collision detection and mitigation strategies for developing on-board computer software. There has been no study on how such variations affect the strategies and the design of an early warning system and such is the purpose of this paper.

The DSRC device uses a bandwidth around the 5.9GHz range and it is based on the proposed IEEE 802.11p standard (IEEE Task Group p). The National Highway Traffic Safety Administration has commissioned a study in 2006 to assess the effectiveness of such technology on road safety (U.S. Department of Transportation, 2006b). In this study, DSRC tests were performed to evaluate the safety benefits.

## II. EXISTING SYSTEM

In the existing system with the help of GPS and electronic control unit (ECU) data, vehicles are able to get their own motion data such as position and speed. Communication is available between those vehicles equipped with DSRC modules within each other's radio

range. In this way, vehicular ad hoc networks (VANETs) are formed. A subject vehicle (SV) will be able to get a lead vehicle (LV)'s data of position, speed, etc. With both SV's and LV's position data, measured headway distance  $Mhd$  can be calculated.  $Mhd$  and velocity of both SV and LV are the input to the rear-end collision warning model and corresponding warnings will be the output: Early warning is issued to activate the human-machine interface (HMI) to remind the driver to decelerate, and emergency warning is triggered to launch the automatic control systems (ACSs) to brake.

## DRAWBACKS

Slightly poor performance in an intersection scenario. Another study has found probability of successful message reception is around 90% at 300m and drops off with longer distance.

## III. PROPOSED SYSTEM

Car-2-x communication is an emerging technology that allows vehicles to communicate with each other. The exchange of real-time data among vehicles between vehicles and roadside units. Proposed system consists of three units such as control unit, monitoring unit and Vehicle units. This entire unit control by ARM cortex M3 controller with I2C and SPI. With this DSRC, helps to improve Road safety, Traffic efficiency, Traffic congestion control.

### A. BLOCK DIAGRAM

The proposed system consists of three units.

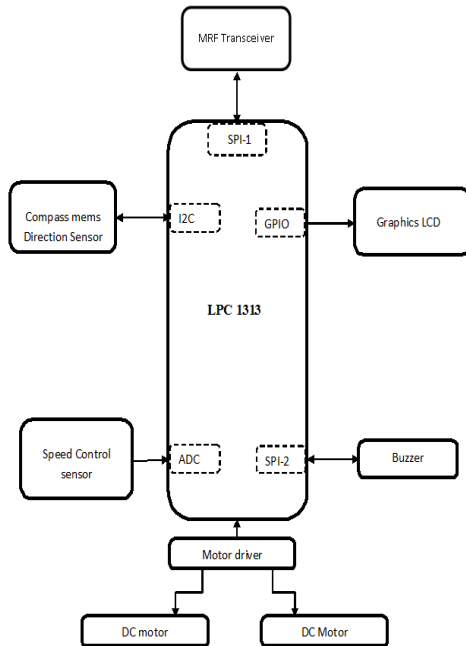


Figure .1. Control and monitoring unit

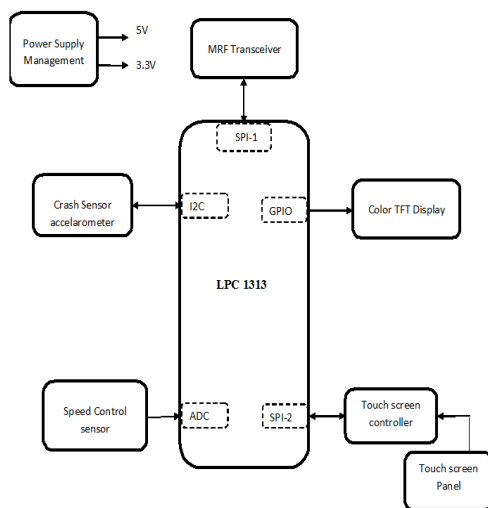


Figure. 2. Vehicle Unit

### Forward hazard warning

If a vehicle detects an incident such as emergency braking, accident, it adds this

information to its periodically broadcasted Cooperative Awareness Message which is sent to all vehicles in the close vicinity. Other cars or motorcycles receives the information and decide either to warn the driver if the hazardous location is on the route in front or just to broadcast the information to warn other vehicles.

### Traffic light timing display

The vehicle approaches the traffic light that is currently red. Based on the received traffic light phase schedule, 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.

### Intersection collision warning

While the motorcycle is riding on the main road, a car is approaching the intersection from the right-hand side. Due to a view obstruction, the car driver is overlooking the approaching motorcycle. When driving onto the intersection, the car driver receives a warning of the approaching motorcycle. The rider also receives a warning on its HMI.

### Road speed limit warning

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

## B. PROPOSED SYSTEM DESCRIPTION

**Power management system:** It provides 3.3V to LPC1313 and required voltage .

**Microcontroller:** 32-bit ARM Cortex-M3 microcontroller that is LPC1313.

**MRFTxceiver:** It is a wireless network protocol IEEE 802.15.4(miwi) used to communicate between all the three units.

**Touch screen Display:** A color touch screen TFT display with QVGA resolution is used to select a desired application.

**Graphics LCD:**It is used to show the vehicle status and other info to the driver.

**MEMS Compass:**It is used to find the direction of the moving vehicle according to the rotation of the DC motor.

**MEMS Accelerometer (LPC 302 DL):**It is used to sense accident situation by sensing the vibration of the vehicle.

**Vehicle Speed Control Sensor:**It is used to increase or decrease the speed of the vehicle

**Buzzer:**It is used to provide warning sound to the driver

**DC Motor:** It is used to emulate a running vehicle driven by a motor driver circuitry. Motor driver (L293 DNE) provides high noise immunity inputs.

**Battery:**It is used to power all the electronics and motors in the project.

#### IV. CONCLUSION

The road adaptive over take assistance system based on the DSRC which make use of wireless technology. The proposed approach can achieve the best performance, leading to more efficient use of wireless bandwidth. Adopting this in vehicular networks can both avoid transmissions of emergency messages, wasting bandwidth due to unnecessary rebroadcasts and prevent emergency messages from transmission collisions caused by serious packet contention. This system helps the driver to avoid rear-end collisions in low speeds.

#### REFERENCES

[1] T. Wilson, S. Miller, M. Burns, C. Chase, D. Taylor, W. Butler, D. V. McGehee, and T. A. Dings, "Light vehicle forward-looking, rear-end collision warning system performance guidelines," *Sensor Technol.*

*Syst. Inc.*, Scottsdale, AZ, USA, Rep. DTNH22-93-C-07326, May 1998.

[2] R. H. Raschofer, M. Spies, and H. Spies, "Influences of weather phenomena on automotive laser radar systems," *Adv. Radio Sci.*, vol. 9, pp. 49–60, 2011.

[3] J. Luo and J. P. Hubaux, "A survey of inter-vehicular communication," EPFL, Lausanne, Switzerland, Tech. Rep. IC/2004/24, 2004.

[4] M. Distner, M. Bengtsson, T. Broberg, and L. Jakobsson, "City safety—A system addressing rear-end collisions at low speeds," in *Proc. 21<sup>st</sup> Enhanced Safety Veh. Conf.*, 2009, pp. 1–7.

[5] G. Marsden, M. McDonald, and M. Brackstone, "Toward an understanding of adaptive cruise control," *Transp. Res. C, Emerging Technol.*, vol. 9, no. 1, pp. 33–51, Feb. 2001.

[6] O. Ararat, E. Kural, and B. A. Guiven, "Development of a collision warning system for adaptive cruise control vehicles using a comparison analysis of recent algorithms," in *Proc. IEEE Intell. Veh. Symp.*, Jun. 2006, pp. 194–199.

[7] D. Reichardt, M. Miglietta, L. Moretti, P. Morsink, and W. Schulz, "CarTALK 2000 Safe and comfortable driving based upon intervehicle- communication," in *Proc. IEEE Intell. Veh. Symp.*, Jun. 2002, pp. 545–550.