TEST Engineering & Management

January - February 2020
ISSN: 0193 - 4120 Page No. 4634 - 4637

Advanced Driver Alert System for Ambulance Passby

Kanthimathi M, Department of Electronics and Communication, Sri Sairam Engineering College, Chennai,India
Somesh Sharma S, Department of Electronics and Communication, Sri Sairam Engineering College, Chennai,India

Article Info
Volume 82
Page Number: 4634 - 4637
Publication Issue:
January-February 2020

Article History
Article Received*: 18 May 2019*
Revised*: 14 July 2019*
Accepted*: 22 December 2019*
Publication*: 23 January 2020*

Abstract:
This paper aims at solving the most important issue in a populated country like India where an ambulance spends more time on the roads carrying the patient on their way to the hospital. This time spend on the roads by the ambulance can be reduced with the help of technologies and following a methodology of application. We present an Advanced Driver Assistance System (ADAS) which alerts the driver about the upcoming ambulance in the path of its travel with the help of two-level wireless communication; Vehicle to Vehicle Communication (V2V) and Dedicated Short Range Communication (DSRC). This alerts the driver to make way for the upcoming ambulance which eventually helps the ambulance to spend less time on the roads thereby, increasing the possibility of saving the lives of patients.

Keywords: *Vehicle to Vehicle Communication, C1101 wireless module, Global Positioning System, Dedicated Short Range Communication*

I. INTRODUCTION

The basic concept behind this paper is to create an advance vigilant technique for ambulance pass by in Indian road conditions which alert other drivers well in advance of the approaching ambulance. This Advanced Driver Assistance System (ADAS) basically uses the existing technologies along with advanced technologies like Vehicle to Vehicle (V2V) communication algorithm which allows the vehicles to communicate with the approaching ambulance and Dedicated Short Range Communication (DSRC) which allows the vehicles to communicate with the neighboring vehicles in a short range. This helps in broadcasting the upcoming ambulance's status such as path, distance of separation and time of passage to maximum number of users. The main motivation behind this work is the problems faced by the ambulance in the Indian traffic scenarios. Due to unavailable delay these cases exist more common in India. This in fact leads to the deaths of more than 20% of accident victims, who require emergency treatment but cannot reach hospital in time. The execution is done by acquiring the latitude, longitudinal position and the path of the ambulance using Global Positioning System (GPS) and compute the distance between the vehicles present along the travel path of the ambulance. Broadcasting the data of ambulance (V2V) is carried forward with the help of CC1101 wireless module along with a 5-watt UHF Amplifier. To further actualize DSRC with the nearby vehicles we use the same CC1101 transceiver or any low range transceivers which communicates with the vehicles within a short range. Hence the arrival of the ambulance in the path is notified to maximum number of vehicles. Once the ambulance is passed, the module looks for and notifies about the forthcoming ambulance (if any) along the path of the vehicle. It is believed that the developed system will provide extra time for the doctors to diagnose by saving the time for the ambulance on road and treat the emergency case thereby bringing a significant change in the Healthcare and Hospitality Sector of India.

II. INNOVATIVE ASPECTS

Aware of the fact that there have been many proposed ideas in this sector solving the exact situation, here in this section we will elaborate the innovative aspects regarding this paper. It comprises of various existing and upcoming technologies and

January - February 2020
ISSN: 0193 - 4120 Page No. 4634 - 4637

the innovation lies in the methodology of execution where there will be a two-fold wireless communication which is distinguished mainly on the basis of the range of communication.
This paper proposes an ADAS which comprises of vehicle-to-vehicle communication in two stages.

i. At the first stage, ambulance is enabled to connect with a vehicle, which is in the path of the ambulance, far apart using V2V communication algorithm.
ii. In the next stage, the vehicle which has received the notification, alerts the vehicles nearby within a short range using DSRC algorithm along with the parallel working of V2V. In the proposed system, we use CC1101 to trans receive signals from the structures and to transmit the same to the nearby devices through DSRC algorithm.

III. Requirement Analysis

A. Basic Requirement in the Vehicle

All vehicles considered are assumed to have the ADAS built within it including the ambulance which forms the base platform of the project. This ADAS is a user interfaced screen along with the background alogorithms. This algorithm totally depends upon the GPS which the vehicles must possess inorder to process the data. Along with this computation system there should also be a transreceiver in the vehicles inorder to broadcast the computed data to the the vehicles; for this purpose we consider C1101 wireless module.

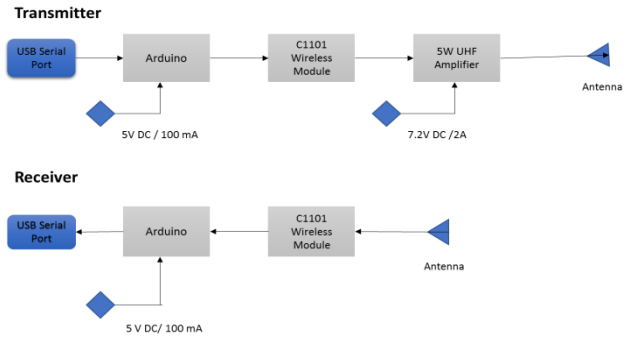
B. Functinal and Non-Functional Requirements

It comprises of a user-friendly interface in allowing the user to get notified by the ADAS. On a higher scope, the user is allowed to modify the extent to which the alert system works.
The non-functional requirements totally deal with the background functionalities like estimation of distance and time (t, x, y) algorithms. Trans receiving signals and deciding the boundary of the short range

C. Technical and Transitional Requirements

Technical requirements include the modules (Renesas, Atmel AVR, PIC18F458 and PIC18F258) and devices like C1101 wireless module, GPS module and other basic requirements of the prototype
The transitional requirements actually act as the embedded bridge between the functional and technical requirements, dealing with the coding part of the project

D. C1101 Wireless Module Circuit



The transmitter and the receiver have the same construction, but the sender receives a power amplifier, which blows up the signals when sending. Foremost, the Arduino Board (instead of the car microcontroller) that generates test data packets and controls the transceiver. We use a CC1101 radio module as a transmitter which is controlled with the help of the SPI interface. The operation of module is dependent on all the micro controllers. It has an output force of 100 mW. This can be practiced without the need for any permit. The antenna and the module are connected with the help of a power amplifier, due to which the transmission power will boost up to 8 watts. After the amplifier we connect an antenna which is resonant for 70 cm ham band.

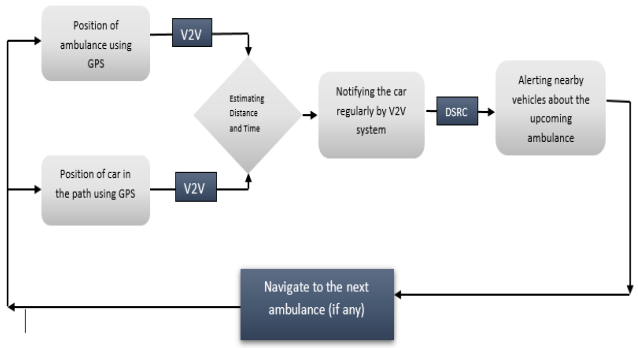
January - February 2020
ISSN: 0193 - 4120 Page No. 4634 - 4637

For the test, the Arduino board is used and it transmits data packets every second to the receiver.

We use the same CC1101 module as receiver and is connected to an Arduino board. Its main job is to forwards the received data packets to the serial interface. A larger antenna is preferable for a better gain. For the test on receiver car, we use the microcontroller of the receiver car, which is considered as Arduino here.

The amplifier operates in the frequency range from 380 MHz to 450 MHz. The output power can be controlled by giving an input voltage to the amplifier. At 5 volts, we can observe the output power is around 2.5 watts. A maximum voltage of 10 volts, which gives rise to 8 watts of power. The step-up controller is used to convert to 7.2 volts, which give rise to an output power of 5 watts. With 7.2 Volts, the amplifier is made to operate continuously. The input signal is about 10 milliwatts, which is sufficient for a substantial gain.

IV. System Design and Architecture



V. Methodology

A. *PHASE 1:*

1. Mapping the route to the nearby hospital by the ambulance
2. To acquire the latitude and longitudinalposition of the ambulance
3. Finding the vehicles in the path of ambulance using C1101 wireless module
4. Estimating the distance and time of arrival to the current location of vehicle using V2V algorithm

B. *PHASE 2:*

1. Notifying the Vehicle about the time of arrival of the ambulance using C1101 wireless module
2. Amplifying the signal using **5-watt UHF Amplifier** in order to broadcast it to nearly 5 Kms (appx.)
3. DSRC communication among vehicles within the short range using C1101 wireless module/ Zigbee module
4. To navigate to the next forthcoming ambulance (if any) on passing the current one

VI. Social Relevance

- ✓ The problem faced in India is the delay of ambulance caused by traffic, which leads to the deaths of more than 20% of patients, who require emergency treatment but cannot reach the hospital in time this project is intended to resolve this
- ✓ Prior information about the arriving ambulance helps the vehicles to manage the traffic, thereby helping the ambulance to bypass the vehicles
- ✓ This project will provide extra time for the doctors to diagnose by saving the time for the ambulance on road and treat the emergency case thereby bringing a significant change in the Healthcare and Hospitality Sector of India.

VII. Limitations

- Vehicles need to have this ADAS for the working of this proposed project
- Connectivity issues may occur while broadcasting the signal which may result in minimizing the vehicles being notified

January - February 2020
ISSN: 0193 - 4120 Page No. 4634 - 4637

VIII. CONCLUSION

In this paper, the methodology of application of the Vehicle to Vehicle communication along with the Dedicated Short-Range Communication can serve as a potential project for the future where the autonomous cars can take over the manual ones. With the proposed technique been helpful in solving a specific purpose, future works have been planned to increase the range of applications by enabling the user to act as originating points like the ambulance and communicate to the vehicles. In order to improve the range, we could also seek the help of road side infrastructures; which could act as communication links with the help of vehicle to infrastructure communication (V2I)

IX. REFERENCES

1. Arghavan Amini1, Reza Monir Vaghefi2, Jesus M. de la Garza1, and R. Michael Buehrer2 Improving GPS-Based Vehicle Positioning for Intelligent Transportation Systems Intelligent Vehicles Symposium (IV), 2014 IEEE
2. Shunsuke Tsurumi, and Takeo Fujii Reliable Vehicle-to-Vehicle Communication using Spectrum Environment Map 978-1-5386-2290-2/18/$31.00 ©2018 IEEE
3. MallikarjunaGowda C P, RajuHajare, C S Mala Rakshith K R, Anuj R Nadig, Prtathana P Design and Implementation of Real Time Wireless System for Vehicle Safety and Vehicle to Vehicle Communication 2017 International Conference on Electrical, Electronics, Communication, Computer and Optimization Techniques (ICEECCOT)
4. Usha Devi Gandhi, Arun Singh, Arnab Mukherjee and AtulChandak Smart Vehicle Connectivity for Safety Applications 2014 International Conference on Reliability, Optimization and Information Technology - ICROIT 2014, India, Feb 6-8 2014
5. Mohammed AteeqAlanezi* A proposed System for Vehicle-to-Vehicle Communication: Low Cost and Network Free Approach Indian Journal of Science and Technology, Vol 11(12), DOI: 10.17485/ijst/2018/v11i12/121337, March 2018
6. Dr. A. Balamurugan1, G. Navin Siva Kumar2, S. Raj Thilak3, P. Selvakumar Automated Emergency System in Ambulance to Control Traffic Signals using IoT International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 4 Issue 4 April 2015, Page No. 11533-11539
7. https://www.aeq-web.com/arduino-iot-ultra-long-distance-wireless-data-transmisson/?lang=en