Vehicle to Vehicle Communication

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Abstract: *Vehicle to vehicle communication is a popular topic in the academia and the car industry. The aim of these growing is to develop an effective communication system for the Intelligent Transportation System (ITS). The paper gives the methods followed to get the results for efficient communication between the vehicles and the much-needed safety.*

Keywords: Vehicle-to-Vehicle (V2V) Communication, Intelligent Transport System (ITS), Technologies, Safety, Transportation

1. Objective

To provide efficient vehicle to vehicle communication that avoids road accidents and assures safety driving.
- Emergency warnings
- Congestion policies
- Methods for emergency warning dissemination

2. Motivation

- Time spent in cars
- Rapid research progress in inter-vehicle and intra-vehicle communication
- Public safety
- Great market potential
- Extended driving vision
- Communication is development

3. Introduction

Vehicle to vehicle communication systems are the emerging type of networks in which vehicles use a dynamic wireless exchange of data between nearby vehicles providing each other with information, such as safety warnings and traffic information.

V to V communication is the part of the growing towards pervasive computing, a concept known as the Internet of Things (IOT).

The goal of V to V communication is to prevent accidents by allowing vehicles in transit to send positioning trend and speed data to one another over an Adhoc mesh network.

Depending on how the technology is implemented the vehicle's driver may simply receive a warning should there be a risk of an accident or the vehicle itself may take pre-emptive actions such as braking down or stop right away.

The paper gives us the thorough sense of how the communication between vehicles takes place and how the safety protocol is considered.

The objectives are enlisted with the corresponding results shown with the images in the results section, and the steps carried out to achieve the desired output. The flowchart is also provided to perceive the intended meaning of the entire project diagrammatically.

4. Methods

The methods used to meet the results are:
- Light Communication
- Image Processing
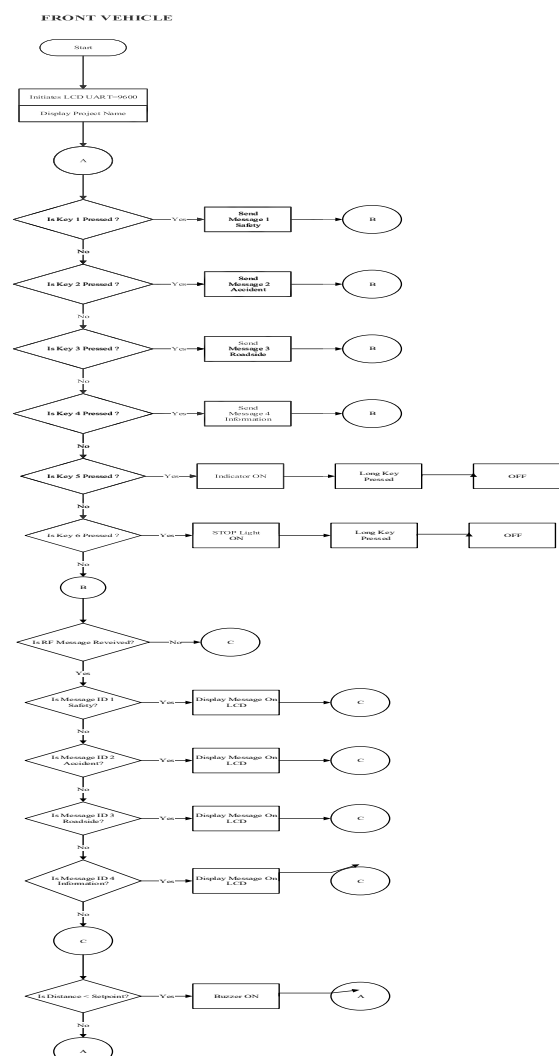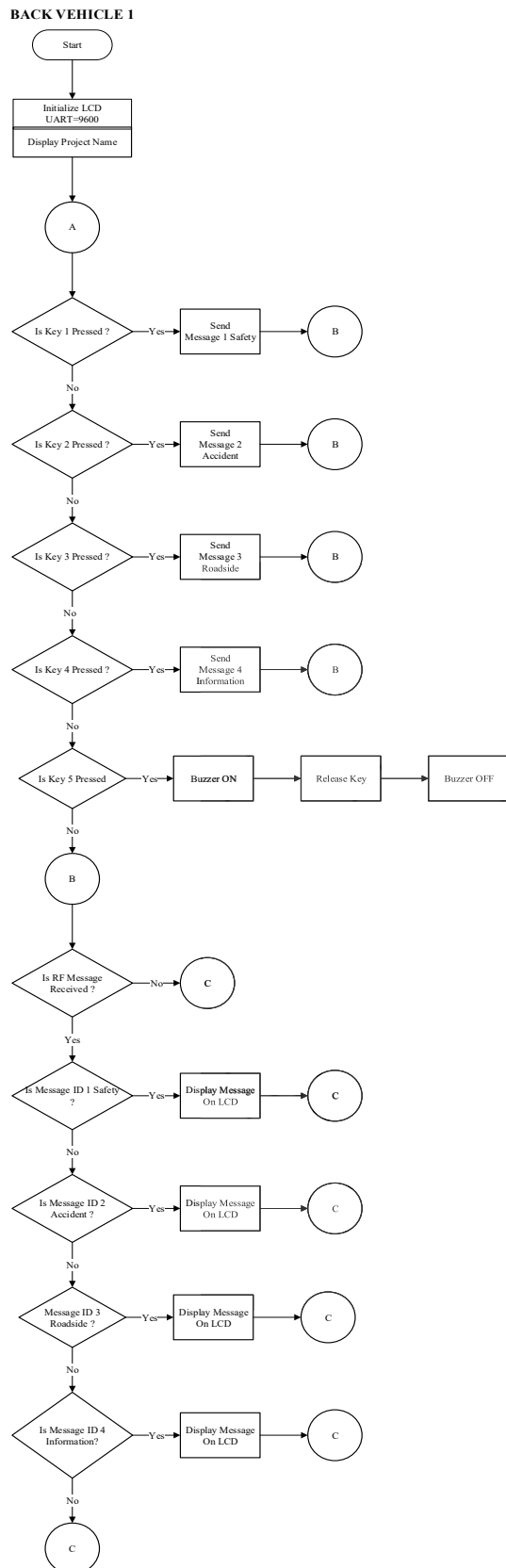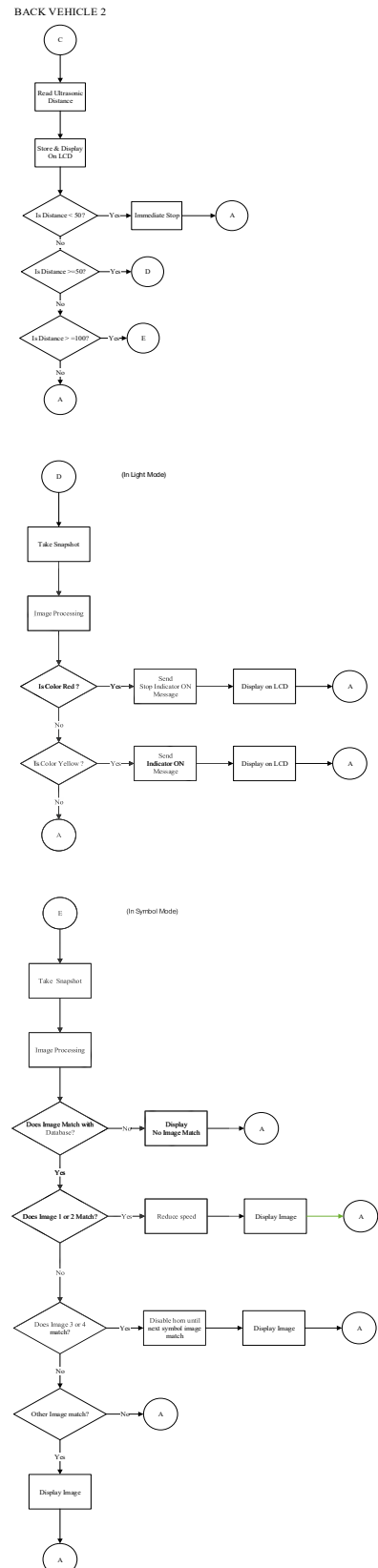- Symbol Recognition
- Wireless Communication

5. Flowchart

Figure 1: Flowchart for front vehicle.

Figure 2: Flowchart for back vehicle.

Figure 3: Flowchart for back vehicle continued

6. Result

A. Camera based optical light communication

The image captured by camera, of lights on the car ahead, is processed. The car in the front if applies brakes then the red lights at the back glow and this is detected by the car behind, when in light mode. The front car when wants to turn, it will

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switch ON the indicator and the back car will capture the image and process it showing the 'Indicator is ON' sign warning.

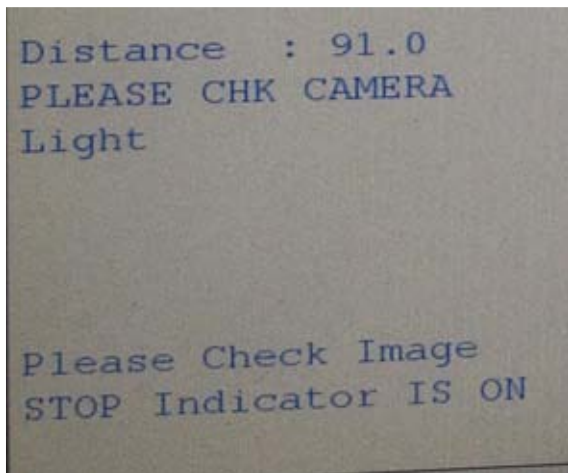**Figure 4:** Stop Indicator On (brake) displayed on screen

Figure 5: Stop indicator ON signaling the vehicle about the application of brakes

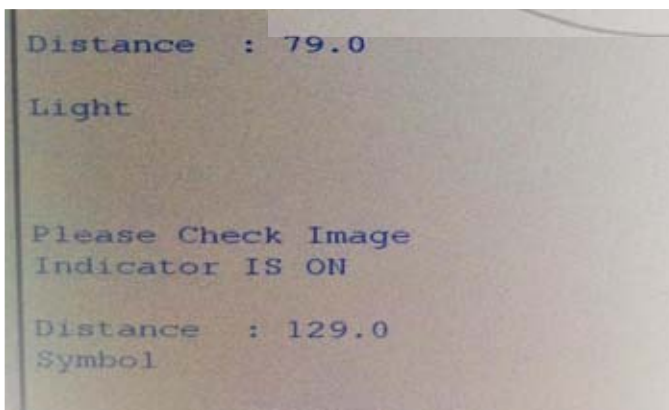**Figure 6:** Displaying the Indicator ON message.

Figure 7: Indicator ON

B. Symbol Recognition

First, the database of images will be created to compare them with the live feed images. The vehicle while in symbol mode captures the images with symbols and compares with the ones stored in the database. After capturing symbols the vehicle will take subsequent actions wherever necessary. The symbols such as speed limit, where the vehicles must limit its speed below the given value, the buggy will be slowed down. Furthermore, when there is any no horn zone for example, hospital area, the horn will be disabled for that instance and will not be turned ON until next symbol is recognized. Hence symbol recognition helps us to maintain the road ethics in an adept way.
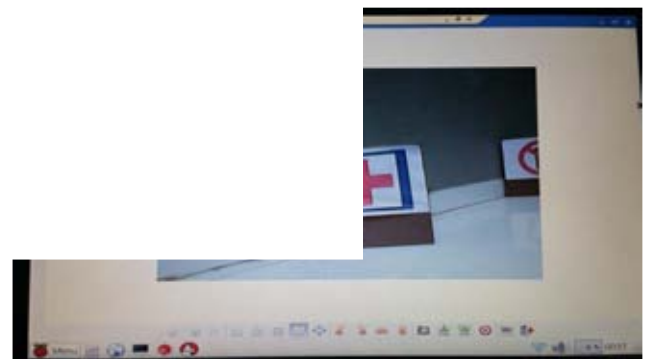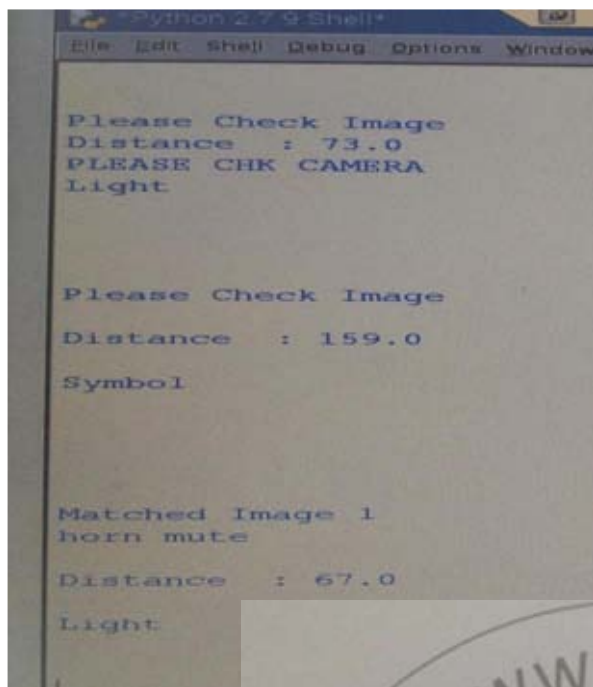

Figure 8: Database image matched with the live feed and displayed on the screen.

Figure 9: The buggy while in symbol mode showing the matched symbol and showing the carried out the action, here muting the horn near the hospital area

C. Accident Avoidance

Here the ultrasonic sensors, also known as transducers, are used which measures the distance. The sensor works on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Distance measurement is done in continuous-wave or the pulse echo technique. In the continuous wave method the transmitter generates a continuous output, whose echo is detected by a separate receiver. Accuracy depends on the measurement of the phase shift between the transmitted and the reflected wave.

Here when the distance between the two cars becomes less than that of the preset value, the vehicle stops right away. This saves the vehicle from going too close to the vehicle ahead and ultimately crashing on it. So with the careful and effective use of ultra-sonic sensor, road accidents can be minimized.

Moreover as an addition to it the driver can be warned using a buzzer about the closure of the vehicle with the front vehicle. A buzzer is a signaling device; used in automobiles, household appliances, etc. the piezoelectric sound components operate on the principle utilizing natural oscillation of piezoelectric ceramics. This may also help the driver in controlling the vehicle in time; which will also lower the possibilities of accidents.
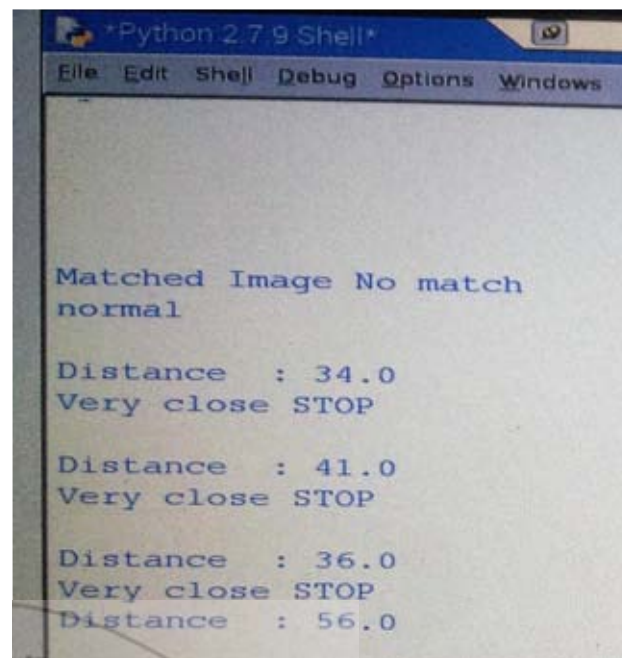
Figure 10: Displaying the distance between the buggies on the screen and stopping the buggy when the distance is less.

Figure 11: Displaying the Buggy STOP action on the LCD

## D. Vehicle To Vehicle Message Communication Using Zigbee

Zigbee is used for wireless message transfer between vehicles. Zigbee is the name of a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4_2006 standard for wireless personal area networks (WPANs), such as wireless headphones connecting with cell phones via short range radio. The technology is intended to be simpler and less expensive than other WPAN's such as Bluetooth.

As Zigbee being a trans-receiver, each vehicle consists of a module to transmit and receive the required messages. The different types of messages used here are:

- **The Information message**
If there is any congestion on the road then the driver will inform the other vehicles about it by sending the message. Also if there is any road barrier information to be transmitted around, it can be done using Zigbee.
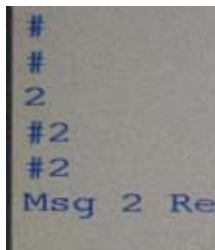
Paper ID: ART20171578   622
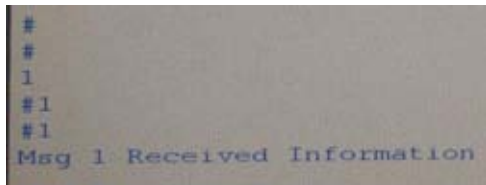
Figure 12: Displaying on screen the ZIGBEE message number 1 transferred regarding information between two vehicles
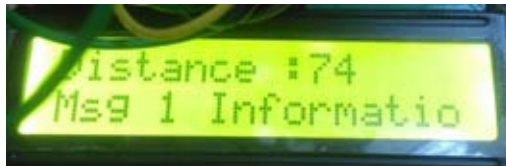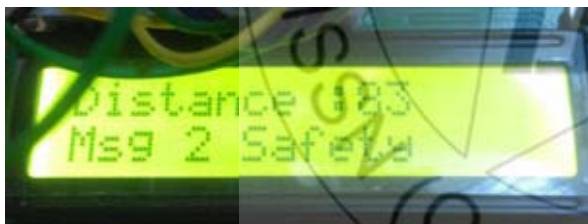

Figure 13: Displaying message transfer on LCD

- **The Safety message**

When any symbol is recognized the vehicle doing so will send the message to the other vehicles alerting them. This will assure help in maintaining road ethics and will provide safety of the drivers giving warning to them.
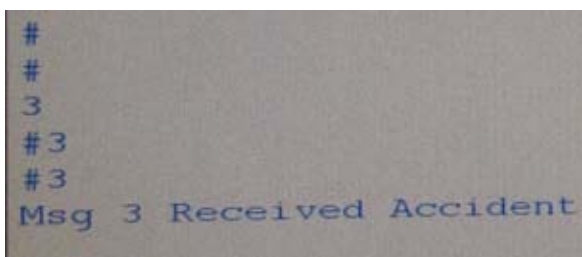

Figure 12: Displaying on screen the ZIGBEE message number 2 transferred regarding safety between two vehicles.

Figure 13: Displaying the message on LCD

- **Accident avoidance message**

Any obstacle when detected by either of the vehicles, the corresponding message will be transferred to the other one cautioning the driver about the distress. As written above the buzzer can be used for addressing the driver about the obstacle and then he/she would send the respective message to other drivers.

Figure 14: Displaying on screen the ZIGBEE message number 3 transferred regarding accident between two vehicles
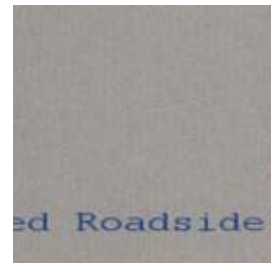

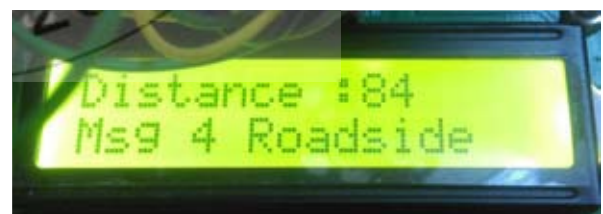**Figure 15:** Displaying the message on LCD.

Figure 16: On detecting the object at the front end of the vehicle the message is displayed on LCD

- **Roadside vehicle to vehicle message**

Zigbee is used here to communicate between vehicles and ultrasonic sensors for obstacle detection. Accordingly, if any accident or other physical mishap has occurred on road; the nearby vehicles can be informed of it. The ones near the hospital or the police unit may inform them about the mishap or accident. The required assistance might be then given to them resulting in saving life and providing safety.

Figure 17: Displaying on screen the ZIGBEE message number 4 transferred regarding roadside between two vehicles

Figure 18: Displaying the message on LCD

7. Summary

The system implements many measures to provision safety for vehicles on road; also, gives information by carrying out vehicle to vehicle communication. Various smart, low power and effective components are used productively to obtain the required results. A sincere effort has been taken to provide a cogent way for accident avoidance, catered with a good reliability and high stability system.

8. Conclusion

Emerging wireless technologies for vehicle to vehicle communication are promising to efficaciously reduce the number of fatal roadway accidents by rendering early warnings. The paper procures one of the ideas to do so in a simple way by using some of the effective components. The system lucratively provides safety of vehicles which is the prime focus of any vehicle to vehicle communication system.

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