Wireless Sensor Network Based Safety Vehicle with Smart Dashboard

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Abstract

Now a days, problem of traffic jam and road accidents is more stressful and it is affecting on public safety and environment.1.24 million deaths are due to road accidents and causes are ignorance of driver, roadside distractions, narrow bridge etc. So to solve this problem with smart solution methodology is combination of 'Wireless Sensor Network' (WSN) and "Intelligent Transportation System' (ITS). ITS is costly as well as it is preferable to metropolitan citizens only so WSN is included with more features and cost effective focusing on public safety. It is a combination of radio sensors and vehicular sensors so that it will alert the driver by giving indication with buzzer before some time so that accident will be avoided. For this we have mounted a smart dashboard on any vehicle.

Index Terms **– Smart Dashboard, Ultrasonic Sensors, RF technology, SPI protocol, Arduino.**

I. INTRODUCTION

This proposed system consist of vehicular technologies. Vehicle to Vehicle communication is for short range communication, Vehicle to Infrastructure have large range of communication. For this communication I have used WSN because they are self-organizing and self-healing. Sensors are low power, limited memory, energy constrained due to their small size. Then for the working of all these technologies I have followed SPI protocol. I have made this system for only six conditions at primary level, further many condition which commonly cause the road accidents can be added. These conditions are:

(1)Accident due to' Narrow Bridge'-If there is' narrow bridge 'at certain distance, then while travelling at night, this system will give alert indication before some time so that we will be alerted about the bridge , and can take any precautious action if required. **For e.g.** as in case of bus driver or taxi driver. If such a system is built in bus then it will prevent accidents due to bridge as happened in 'Mumbai Goa highway bridge accident collapse Mahad to Poladpur.

(2) Accident due to 'Roadside Divider'-If 'roadside divider' is occurs at certain distance, then before some distance we will get indication on 'smart dashboard' and LED starts glowing with buzzer. It will save our vehicle to get dash to the divider and we will be safe.

(3) Accident due to 'Infrastructure'- Most of times this situation comes that suddenly vehicle comes from the right side and due to high speed of both the vehicles, collision occurs and both drivers get injured. So, this system will alert us before some time so that we can pass our vehicle after the vehicle of opposite side passed away. It will avoid collision of two vehicles.

(4) Accident at 'T- shape'- If at the same time vehicles are coming from both left and right side then we will be alerted before some time and can avoid accident.

(5) Accident due to 'Frontal Collision': If driver is careless while driving and if suddenly vehicle come from front side then due to indication of LED with buzzer before some time driver get alerted before some time or a minute can control the collision or avoid the collision.

(6) Accident due to 'Back Collision'-Similarly, to save our vehicle from back collision this system will work effectively and collision of both vehicles we can avoid.

II. EXISTING SYSTEMS

1) A vehicle to vehicle communication protocol for co-operative collision warning: In this, they have proposed a vehicle to vehicle communication protocol for collision warning. They have emerged wireless technologies for vehicle to vehicle (V2V) and vehicle to roadside (V2R) communications such as DSRC, it provides early warnings in various road situations and reduce the number of fatal road accidents. They have also congestion control policies.

2) Performance of vehicle to vehicle communication using IEEE 802.11p in vehicular Ad-hoc network environment: In this, they have overcome the problem of CSMA by using STDMA for real time data traffic between vehicles. They have done the use of V2V communication, DSRC radio system, VANET and Ad-hoc network architecture as it supports the direct V2V communication. The IEEE 802.11p standard which is intended for V2V Ad-hoc communication in high speed vehicular network environments.

3) Toyota safety vehicles: They have designed pre-crash safety system with pedestrian detection and collision avoidance support functions. In this, they have made fusion of millimeter wave radar with enhanced detection functions and newly developed stereo camera. This system retracts the seatbelts and warns the driver when possibility of a collision detected.

III. PROPOSED ENHANCED SYSTEM

Proposed algorithm is based on sensors. It consists of 2 key components: RF transmitter – receiver and Ultrasonic Sensor. And the protocol followed is SPI protocol. Here we have used multiple transmitters and single receiver along with ultrasonic sensors for distance measurement. Let us see the working of each module in detail one by one.

1. Narrow Bridge: Here if we mounted the narrow bridge module on the required bridge then the RF transmitter will transmits the message to the vehicle coming from some distance up to 100 meters. So we will get indication on smart dashboard which we have implemented on vehicle and we will be alerted. Further we can add feature such as we can also get the information about the status of the bridge.

2. Roadside Divider: Many times our vehicle get dash to the divider or sometimes public transportation vehicles such as bus get dash to the roadside divider and so many people get injured. So to avoid this our system will work. Ultrasonic senses the divider up to 50cm and immediately we get indication on dashboard that divider detected so we will get alert.

3. T - Shaped: Many times we had got experience that suddenly vehicle comes from opposite side and to avoid collision we have to brake hard, it might cause severe accident also. To avoid such situations in very efficient manner we have used ultrasonic sensors. If suddenly vehicle comes from either left or right side then before 4 meters we get indication on dashboard that vehicle is coming whether from left or right side with buzzer.

4. Frontal or Back collision: This feature is useful when driver is careless while driving and at the same time suddenly vehicle comes from the front or back side to avoid collision. Main advantage is that it indicates us before 4 meters so that we can take any necessary action.

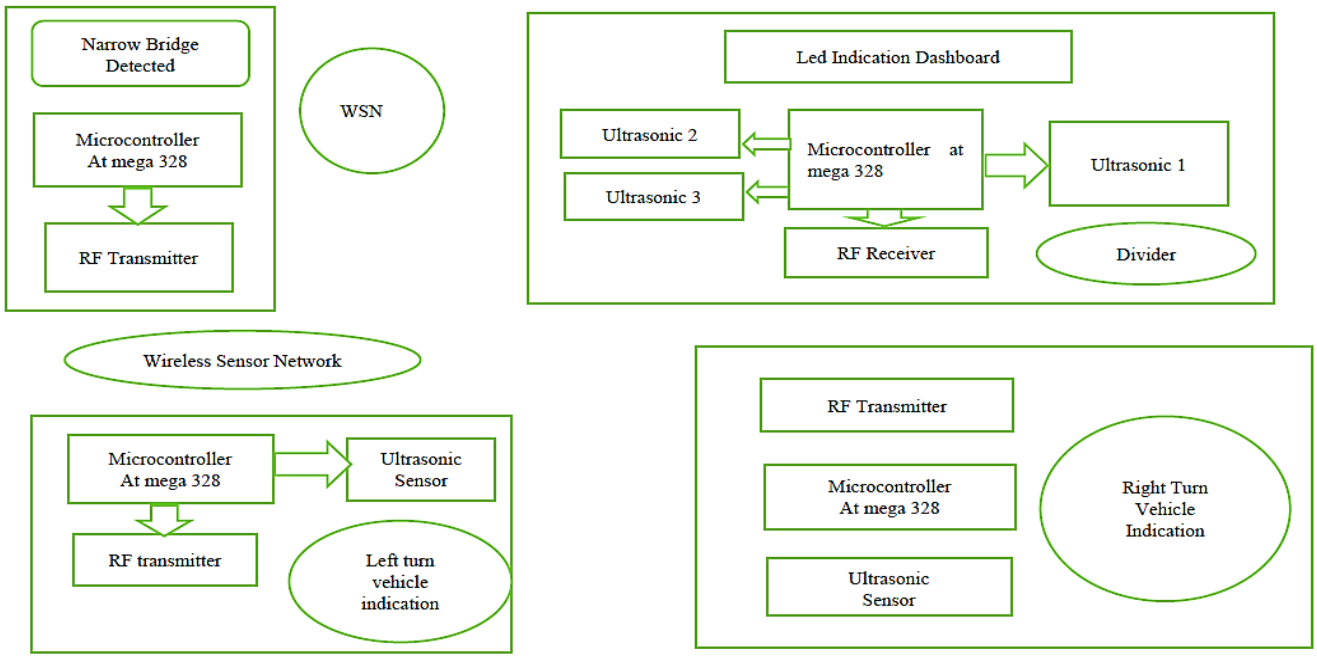

Fig 1. Block diagram

IV. MODIFICATIONS

In this system, I have used RF transmitter, Ultrasonic sensor and Arduino Uno using these components only I have made "smart dashboard" which will detect the possibility of collision and will alert driver before some time by giving the LED indication with buzzer signal and avoid accidental situation. This system is very cost effective than others and we can implement this dashboard on any vehicle.

V. ALGORITHM

1. Sensing distance by ultrasonic sensor
2. Checking the condition of collision
3. If yes then LED indication with buzzer
4. Avoid accidental situation
5. End of the process

VI. EXPERIMENTAL ANALYSIS AND RESULTS

I have selected the test images for vehicle detection. In this images I have shown wireless modules, smart dashboard on which we will get all the indications. Dashboard is a smart dashboard which symbolize or indicates the vehicle coming from long distance of our opposite side or from left or right side and if divider detected it will also give indication with buzzer due to its infrastructure. Following figs shows the concern model:

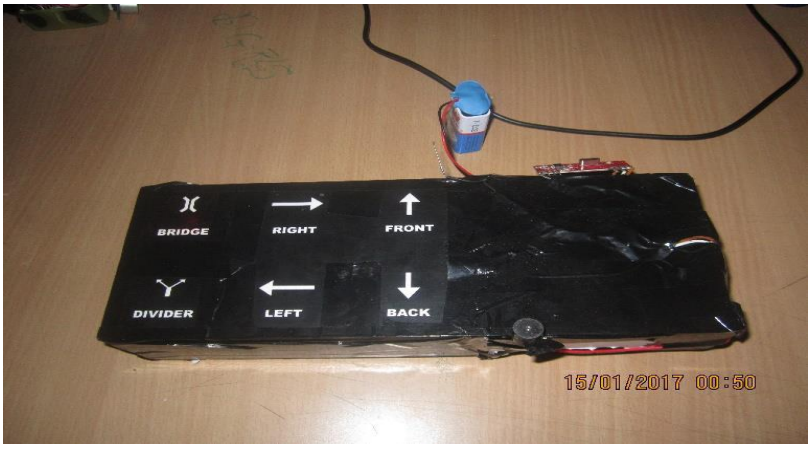

Fig 2. Smart Dashboard

Fig 3. LED indication when suddenly vehicle coming from back side.

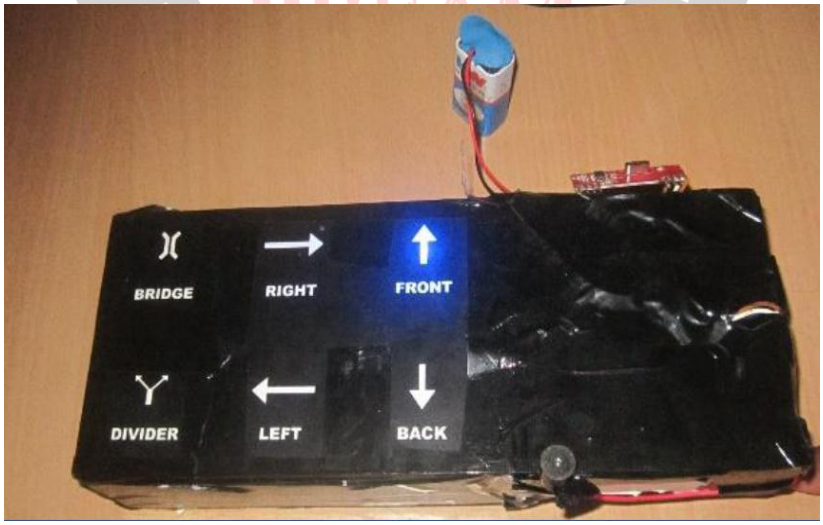

Fig. 4. LED indication when suddenly vehicle coming from front side.

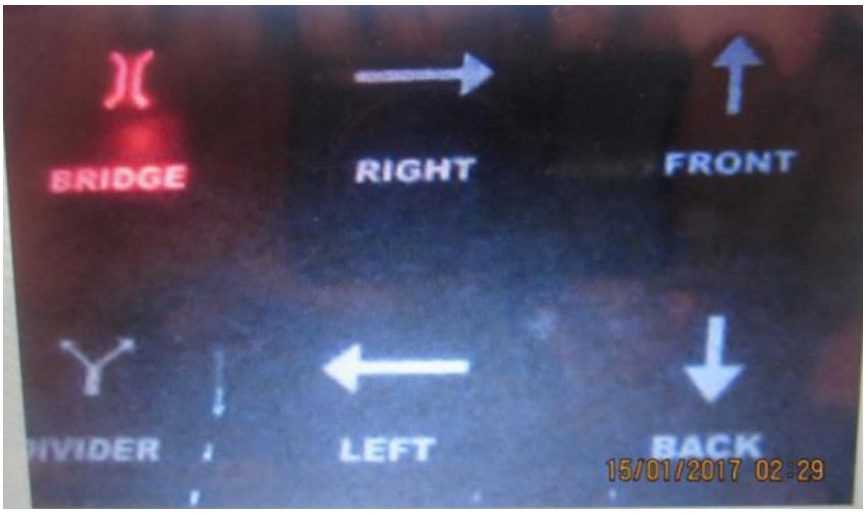

Fig 5.LED indication when there is narrow bridge at certain distance.

Fig 6. LED indication when suddenly vehicle coming from right side.

Fig 7. Wireless module for mounting on any vehicle

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