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Reliable ZigBee Based Automatic Vehicle Speed Control System Using Tree Routing Algorithm

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***Abstract*— Nowadays the drivers drive vehicles at high speed even in speed limited areas without considering the safety of the public. Many accidents are taking place frequently due to the small mistakes while driving in school zone, hospitals, hills area, and highways result in loss of many lives. Therefore, in order to avoid the accidents and to alert the drivers for controlling the speed of the vehicle, ZigBee based Tree Routing algorithm is proposed. ZigBee technology gives the alert signal to the driver about the zones with the help of buffer and limits the speed of vehicle. ZigBee based routing algorithm is established in the form of mesh network for transferring the information between two or more vehicles. Here, GPS circuit is considered for tracking the longitude, latitude, distance travelled, direction of travel and time. Whenever the vehicle is crossing a particular region with a certain speed, the GPS feeds the signal to the processor. When the vehicle speed exceed beyond the limit, the speed sensor is used to control the speed at the specific location automatically. In addition, Alcohol sensor is placed in a vehicle to identify whether the driver taken liquor or not. ZigBee is a wireless communication protocol which has the characteristics of low power consumption, low cost and self organizing features.**

Key terms: **ZigBee based Tree Routing algorithm, GPS Circuit, Alcohol Sensor, Liquor, ZigBee technology**

I. INTRODUCTION

In today's fast moving world, the rate of accidents is increasing day by day, so the speed of vehicles has to be controlled as much as possible. Most of the accidents reported are mainly due to the lack of speed control and violating the road rules. For this reason, different speed limits are fixed to decrease the number of accidents. ZigBee technology is a new wireless communication standard for attaining the information exchange. The key objective is to increase the road safety, traffic efficiency and to minimize the environmental issues of road transport for both academics and industry.

Researchers are interested to design vehicular communication and networking technology in two realistic ways vehicle to vehicle (V2V) in ad hoc mode and vehicle to infrastructure (V2I) with fixed nodes along the road. ZigBee is given with specification for high level communication protocols using small and low-power digital radios. ZigBee tree routing (ZTR) prevents the route discovery overhead in both memory and bandwidth by distributed block addressing scheme. Later, curve warning systems (CWS) have been designed to identify the curved roads by Global Positioning System (GPS) to avoid accident. The routing protocols of ZigBee are different where the system or users select the optimal routing plan based on the applications.

II. LITERATURE SURVEY

An energy balanced ZigBee tree routing algorithm is designed in [1] for improving the transfer process based on the traditional tree routing algorithm. These data transfer processes consider the routing hop and node residual energy that provides energy consumption. ZigBee -based network routing algorithm is demand distance vector in the establishment of a mesh network and data transmission more similar with Adhoc. The energy balance algorithm effectively avoids low transmitting data between two or more routing path with optimized technique. However, ZigBee tree routing algorithm in routing hop is not optimized.

A Smart Display controller meant for vehicle's speed control and monitors the zones which run on an embedded system, was introduced in [2]. Smart Display & Control (SDC) was designed to fit into a vehicle's dashboard, and displays information on the vehicle. The project is composed of two separate units: zone status transmitter unit and receiver (speed display and control) unit.

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Once the information is received from the zones, the vehicle's embedded unit automatically alerts the driver to reduce the speed according to the zone, it waits for few seconds and otherwise vehicle's SDC unit automatically reduces the speed. However, the vehicles are not able to control their speed when they get any hazard signal from outside of the surrounding.

An effective communication system for intelligent transportation system is developed using ZigBee with wireless communication [3]. The wireless access point model is used in queuing system for automatic speed control. Wi-Fi communication for vehicle system is provided with real time applications when they are disseminating from safety and traffic conditions. ZigBee module allows the processor for transmitting the data rate. But, the connections to the access point with mobile communication are carried out with certain distance. Tree Routing is simple routing where node communication is limited to parent-child links. There is no routing discovery in tree routing and routing overhead. The extended tree routing or improved tree routing is designed in [12] where the neighbor table is used for finding the best neighbor node.

In [4], ZigBee focuses on application of technology in the transportation industry. The application of Radio Frequency Identification and ZigBee in Intelligent Transport Systems is gaining popularity with its widespread use in management of the overall transport sector. Speed control unit sends alert message like please slow down the vehicle to control the speed of the vehicles. It is believed that RFID and ZigBee - based technologies are extensively exploited to improve transportation safety and security, increase the efficiency of the transportation system, ultimately save costs, and improve people lives. Also, Smartcard-based fare payment provides convenience for passengers and efficiency gains for transport service providers.

ZigBee based driver assistance system solution [5] provides the cost-effective, low-power and secures wireless networking features of the ZigBee protocol. It is used to prevent over speeding and to control road accidents in accident prone zones. The solution reduces the speed of vehicle as it approaches the accident prone zones. A ZigBee based unit is installed at necessary waypoints, transmitting relevant information to corresponding ZigBee units installed in approaching vehicles.

The system controls the speed of the vehicle which results in the deceleration of the vehicle and thus in reduction of road accidents. However, hybrid architecture that combines vehicle-to vehicle communication and vehicle-to-roadside sensor communication.

The system detects the presence of alcohol in the vehicle and immediately locks the engine of the vehicle in [6]. At the same time information along with the location of the vehicle is send to three pre-selected contacts. The analog gas sensor is suitable for detecting alcohol this sensor in a Breathalyzer. It has a high sensitivity to alcohol and small sensitivity to Benzene. When the target alcohol gas exist, the sensor's conductivity is higher along with the gas concentration rising, use of simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. Hence, the system reduces the quantum of road accidents and losses due to drunk driving.

Electronic Display controller [7] meant for vehicle's speed control and monitors the zones, which runs on an embedded system and custom designed to fit into a vehicle's dashboard to display information on vehicle. This system is adopted effectively for reducing the number of road accidents caused by speeding vehicles losing control of the vehicle at speed breakers or by driver's negligence towards traffic signals. A new design is planned to control the automobiles speed at remote places for fixed time. Zone status transmitter unit, Electronic Display and Control unit is the essential units for controlling the speed. When the road-sign signal is received from the zones, the vehicle's Electronic Display Controller Unit warns the driver to reduce speed and it waits for driver's response and reduces the speed of vehicle automatically. However, vehicle to vehicle microcontroller communication is not established through Radio frequency so as to avoid vehicle collisions and to prevent deaths.

An RFID is used [9] for limiting the speed of vehicles in restricted zones without interruption of drivers. The RFID reader is attached with the vehicle and the RFID Tag with Zones. These tags are programmed for sending the coded signal when the reader comes in proximity. When the vehicles enter into restricted zones their receivers receive code and speed of vehicles is controlled automatically with micro controller unit inside the vehicle. For managing the DC motor speed, Pulse Width Modulation (PWM) technique is used in [8].

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Microcontroller AT89S52 creates the PWM signal. L293D IC drives the motor with two H-Bridge. 555 IC with opto coupler helps in sensing the speed of DC motor. But, the efficiency remained unaddressed above mentioned methods.

A new system is designed in [10] to identify the detect speed violations on road and helps the driver to obey traffic rules while driving through controlling the speed based on the zone. A new design is planned in [11] for controlling the speed of automobiles at remote places. In automobiles, throttle position is managed by Electronic Control Unit (ECU) based on the inputs received from the accelerator's Pedal position sensor. Microcontroller unit receives the pedal position from sensor and transfers to the ECU. The Microcontroller unit is coupled with wireless module for detecting any other transceiver.

III. AUTOMATIC VEHICLE SPEED CONTROL SYSTEM USING ZIGBEE TREE ROUTING ALGORITHM

ZigBee tree routing (ZTR) prevents the route discovery overhead in both memory and bandwidth using the distributed block addressing scheme. In ZTR, since each node is assigned a hierarchical address, a source or an intermediate node only decides whether to forward a packet to the parent or one of the children by comparing its address with the destination address. The most benefit of ZTR is that any source node can transmit a packet to an arbitrary destination in a network without any route discovery overheads. Due to this efficiency, ZTR is considered as a promising protocol for resource constrained devices in diverse applications such as smart grid project and Internet of Things (IoT). However, in ZTR, packets are forwarded along the tree topology to the destination even if the destination is located nearby. Thus, ZTR cannot provide the optimal routing path, while it does not require any route discovery overhead.

A. BLOCK DIAGRAM:

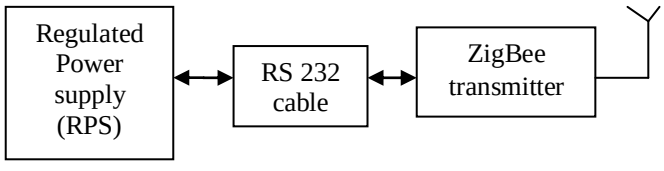

Figure 1: Transmitter for ZigBee based speed control

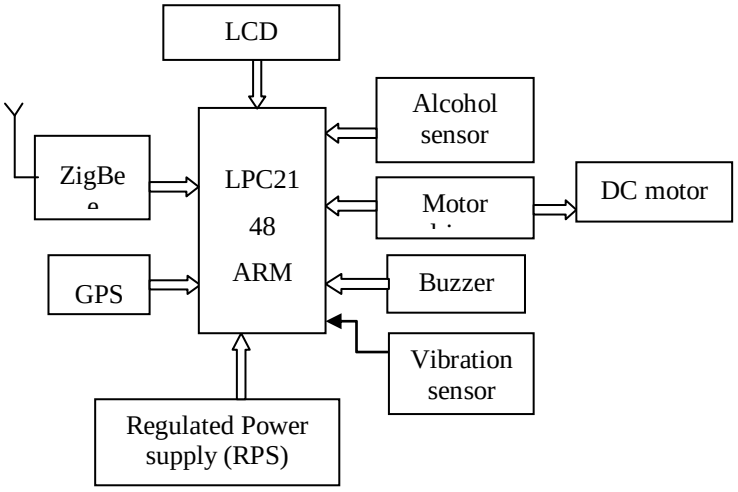

Figure 2: Receiver 1 for ZigBee based speed control

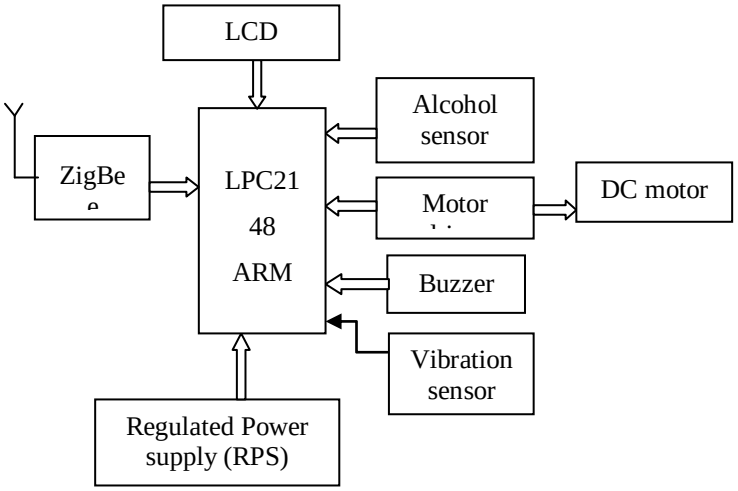

Figure 3: Receiver 2 for ZigBee based speed control

In the figure 1, ZigBee control transmitter is explained. In the RPS regulated power supply, the input is given to the RS 232 cable from which the ZigBee transmits the signal. Figure 2 and 3 explains the ZigBee based speed control receiver. In receiver side, LP2148iicrocontroller is used. For the microcontroller, the receiver signal is collected from the ZigBee transmitter.

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RPS regulated power supply is used for giving the supply to the microcontroller. Alcohol sensor is used in the microcontroller input for detecting whether the driver has consumed liquor or not. Buzzer is used to send the alert signal to the driver in case of any restricted zones. Motor driver is used to drive the DC motor. LCD Display is used to monitor the vehicle speed. The vibration sensor identifies the shock intensity in case of sudden knocks or hits because of the faulty ball-bearings on fans and other equipment.

B. INTRODUCTION ABOUT LPC2148

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

Features of LPC2148

- 8 to 40 KB of on-chip static RAM
- 32 to 512 KB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high speed tracing of instruction execution.
- USB 2.0 Full Speed compliant Device Controller with 2 KB of endpoint RAM. In addition, the LPC2146/8 provides 8 KB of on-chip RAM accessible to USB by DMA.
- One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel. Single 10-bit D/A converter provide variable analog output.
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power real-time clock with independent power and dedicated 32 kHz clock input.
- Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus(400 kbps), SPI and SSP with buffering and variable data length capabilities.
- Vectored interrupt controller with configurable priorities and vector addresses.
- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- Up to nine edge or level sensitive external interrupt pins available.
- Power saving modes include Idle and Power-down.
- Processor wake-up from Power-down mode via external interrupt, USB, Brown-Out Detect (BOD) or Real-Time Clock (RTC).
- Single power supply chip with Power-On Reset (POR) and BOD circuits: CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

C. PIN CONFIGURATION OF LPC 2148

LPC2148 need minimum below listed hardware to work properly.

- Power Supply
- Crystal Oscillator
- Reset Circuit
- RTC crystal oscillator (This is not necessary if you are not using RTC. However this is considered as necessary requirement)
- UART

1. Power Supply

LPC2148 works on 3.3 V power supply. LM 117 can be used for generating 3.3 V supply. However, basic peripherals like LCD, ULN 2003 (Motor Driver IC) etc. works on 5V. So AC mains supply is converted into 5V using below mentioned circuit and after that LM 117 is used to convert 5V into 3.3V.

2. Reset Circuit

Reset button is essential in a system to avoid programming pitfalls and sometimes to manually bring back the system to the initialization mode.

3. RTC Oscillator Circuit

It provides clock for RTC operation.

4. Oscillator Circuit

Oscillations, the heartbeat, are provided using a crystal and are necessary for the system to work.

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5. UART

LPC 2148 has inbuilt ISP within the system by serial communication on COM0. It has COM1 for serial communication. MAX 232/233 IC is used for voltage logic conversion.

The LPC2141/2/4/6/8 microcontrollers are based on 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30% with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2141/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 KB up to 40 KB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

D. ALCOHOL SENSOR

Alcohol sensor is a sensor it is suitable for making Breathalyzer. Alcohol sensor detects the content of alcohol in the breath and thus it attempts to clamp down alcoholics. The output of the sensor is directly proportional to the content of alcohol consumed. Alcohol sensor play a significant role in our society and it has huge applications. An alcohol sensor in cars is a great safety factor which can be embedded in the steering of the cars. When the driver starts the ignition, sensor measures the content of the alcohol in his breath and automatically switches off the car which will stop the drink driving criminals. Thus we can reduce alcohol related road accidents and hence these kinds of detectors have a great relevance. It can also be used in schools, colleges, offices and some public places such as hospitals, libraries etc. Alcohol sensor has good sensitivity and fast response to alcohol.

Alcohol sensor uses PIC16F877A, LCD display, MQ-3 gas sensor, relay and buzzer. The vibration / shock sensor detects shock intensity caused by sudden knocks or hits and continuous vibration due to faulty ball-bearings on fans and other equipment. Vibration sensors are easily installed and fixed to a variety of materials using screws in the housing or with the self-adhesive material supplied. The on-board blue LED visually indicates communication / online and activation.

IV. PERFORMANCE METRICS

In this section evaluate the performance of vehicle speed control system using tree routing algorithm is done using ZigBee technology through Proteus environment. One of the major contributions of this work is to control the speed of the vehicle and transfers the information between two vehicles in case of any accidents. The performance metrics of the parameters are distance, sensitivity rate, energy consumption and efficiency,

The performance metrics are

- Sensitivity rate
- Energy consumption
- Efficiency

4.1. SENSITIVITY RATE

Sensitivity rate is also termed as the true positive rate, recall or probability of detection. Sensitivity calculates the number of positives that are correctly identified. The sensitivity functions about accurately identifying the place where the accidents takes place. In this work, ZigBee based tree routing algorithm is established in the form of mesh network for transferring the information between two or more vehicles in case of accidents. It is measured in terms of percentage (%).

$$\text{Sensitivity Rate}(\%) = \frac{\text{Accurate place where the accident occurs}}{\text{Total Distance}}$$

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Distance (Km)	Sensitivity rate (%)	
	EBZTRA (Existing)	(ZBTRA) (Proposed)
2	65	81
4	69	84
6	72	86
8	75	89
10	78	92

Table: 4.1. Distance Vs Sensitivity (%)

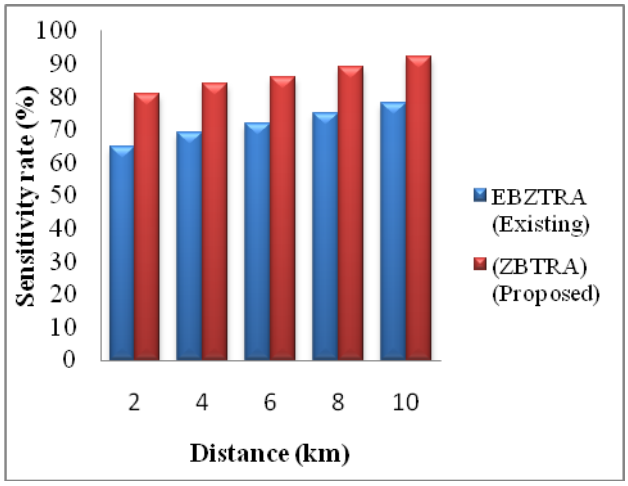

Fig: 4.1. Distance Vs Sensitivity rate (%)

Figure: 4.1. Demonstrate the sensitivity rate. X axis represents distance whereas Y axis denotes the sensitivity rate using both the Energy Balanced ZigBee Tree Routing Algorithm (EBZTRA) and our proposed ZigBee Based Tree Routing Algorithm (ZBTRA).

When the distance gets increased, sensitivity rate gets increases accordingly. The sensitivity rate is illustrated using EBZTRA the existing and proposed ZBTRA Technique. Figure 4.1.shows better performance of Proposed ZBTRA method in terms of distance than existing EBZTRA and proposed ZBTRA. The Tree Routing Algorithm achieves 15 to 20% higher sensitivity rate variation when compared with existing system.

4.2. ENERGY CONSUMPTION

Energy Consumption is defined as the amount of energy consumed while giving the alert signal.

The driver about the zones with the help of buffer for limiting the vehicle speed. It is measured in terms of Joules.

Table: 4.2. Distance Vs Energy consumption (J)

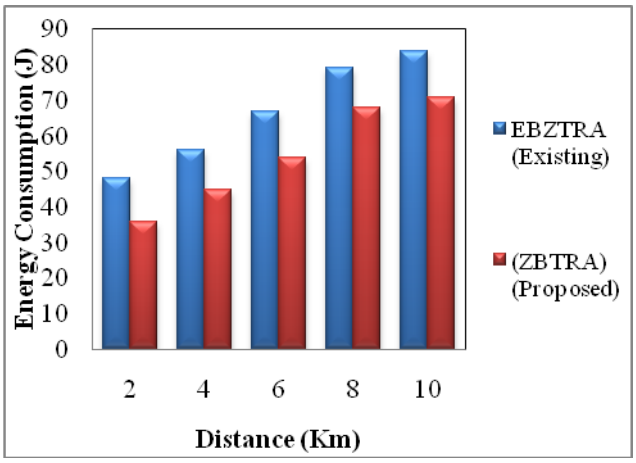

Fig: 4.2. Distance Vs Energy consumption (J)

Figure: 4.2. Demonstrate the energy consumption while limiting vehicle speed. X axis represents the distance whereas Y axis denotes the energy consumption using both the Energy Balanced ZigBee Tree Routing Algorithm (EBZTRA) and our proposed ZigBee Based Tree Routing Algorithm (ZBTRA). When the distance gets increased, energy consumption also gets increased consequently. The energy consumption while limiting vehicle speed is illustrated using the using EBZTRA the existing and proposed ZBTRA Technique. Figure 4.2.shows better performance of Proposed ZBTRA Technique in terms of distance than existing Energy Balanced ZigBee Tree Routing Algorithm (EBZTRA). The ZigBee Based Tree Routing Algorithm (ZBTRA) consumes 15 to 35% lesser energy when compared with existing system.

4.3. EFFICIENCY

Efficiency denotes the level of performance that explains the process that uses lowest amount of inputs to generate the greatest amount of outputs. Efficiency denotes the utilization of all inputs in generating any output with respect to time and energy. Efficiency is a measurable idea determined by output to total input.

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Efficiency in our work explains how effectively the vehicle speed gets limited by driver by hearing the alert signal. It is measured in terms of percentage (%).

Table: 4.3. Distance Vs Efficiency (%)

Distance (Km)	Efficiency (%)	
	EBZTRA (Existing)	(ZBTRA) (Proposed)
10	65	86
20	69	89
30	74	92
40	81	94
50	85	96

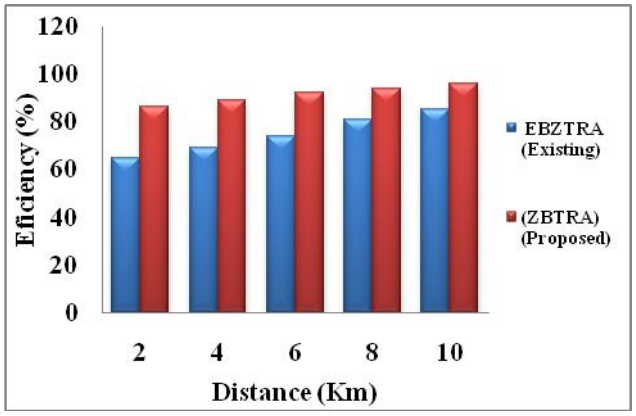

Figure: 4.3. Distance Vs Efficiency

Figure: 4.3. Demonstrate the Efficiency. X axis represents the distance whereas Y axis denotes the efficiency using both the Energy Balanced ZigBee Tree Routing Algorithm (EBZTRA) and our proposed ZigBee Based Tree Routing Algorithm (ZBTRA). When the distance gets increased, efficiency gets increases accordingly.

The efficiency is illustrated using EBZTRA the existing and proposed ZBTRA Technique. Figure 4.3.shows better performance of proposed ZBTRA Technique in terms of distance than existing EBZTRA and proposed ZBTRA Technique. The ZigBee Based Tree Routing Algorithm (ZBTRA) achieves 10 to 25% higher efficient when compared with existing system.

V. CONCLUSION

This paper proposes ZigBee based Tree Routing algorithm to avoid the accidents and to send the alert the drivers for controlling the vehicle speed. ZigBee technology gives the alert signal to the driver about the zones with the help of buffer. ZigBee based routing algorithm is established using mesh network for transferring the information between two or more vehicles. The performance of planned ZigBee based Tree Routing algorithm for controlling the vehicle speed are done with following metrics through the Proteus environment. In future work to extend the process of speed controlling with better upgraded techniques.

REFERENCES

[1] Zhipeng Song, "ZigBee Network Tree Routing Algorithm based on Energy Balance", International Journal of Smart Home, Volume 9, Issue 4, 2015, Pages 85-96
[2] Ankita Mishra, Jyoti Solanki, Harshala Bakshi, Priyanka Saxena, Pranav Paranjpe, "Design of RF based speed control system for vehicles",International Journal of Advanced Research in Computer and Communication Engineering, Volume 1, Issue 8, October 2012, Pages 583-586
[3] Gunjala Shashidhar and Nirupama, "Controlling of Vehicle at Different Zones by using ZigBee and Wifi Communications", International Journal of Innovative Research in Advanced Engineering (IJIRAE), Volume 1, Issue 10, November 2014, Pages 112-115
[4] T. Srivani1, K. Somasekhar Ra, "ZigBee Based Speed Monitoring and Controlling for Transport Navigation System", International Journal of Scientific Engineering and Technology Research, Volume 3, Issue 21, September 2014, Pages 4214-4219
[5]Venkatesh Anand. S and Lokeshwaran.R, "A Reliable ZigBee Based Wireless Automotive Speed Control System",International Journal of Science, Technology & Management, Volume 4, Issue 1, March 2015, Pages 82-87
[6] Pratiksha Bhuta, Karan Desai, Archita Keni Vijayalakshmi Badre, "Alcohol Detection and Vehicle Controlling", International Journal of Engineering Trends and Applications (IJETA), Volume 2, Issue 2, March 2015, Page 92-97

International Journal of Computer Science
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ISSN: 2348-6600
http://www.ijcsjournal.com Volume 4, Issue 2, No 8, 2016. ISSN: 2348-6600
Reference ID: IJCS-151 PAGE NO: 917-924

[7] Gummarekula Sattibabu,, B.V.V.Satyanarayan, VV Satyanarayana Kona, "Automatic Vehicle Speed Control with Wireless In-Vehicle Road Sign Delivery System Using ARM 7", International Journal of Technology Enhancements and Emerging Engineering Research, Volume 2, Issue 8, 2014, Pages 32-34

[8] Khan Masoom Raza, Mohd Kamil, Pushpendra Kumar, "Speed Control of DC Motor by using PWM", International Journal of Advanced Research in Computer and Communication Engineering, Volume 5, Issue 4, April 2016, Pages 307-309

[9] Leena Thomas, Swetha Annu James, Seril Joseph, Arya K B, Tedik Narah and Obang Pangu, "Automatic Speed Control of Vehicles using RFID", International Journal of Engineering and Innovative Technology (IJEIT), Volume 3, Issue 11, May 2014, Pages 118-120

[10] Swati S Sarowar and Seema M Shende, "Overspeed Vehicular Monitoring and Control by using ZigBee",00International Journal of Current Engineering and Technology, Volume 5, Issue 4, August 2015, Pages 2349-2352

[11] U. Jyothi Kameswari, M. Satwik, Lokesh and G. Venkateswara Reddy, "A Design Model for Automatic Vehicle Speed Controller", International Journal of Computer Applications, Volume 35, Issue 9, December 2011, Pages 19 -24

[12] Sujeet D. Gawande and Amit M. Sahu, "To Design Energy Efficient Protocol by Finding Best Neighbour for ZigBee Protocol: A Review", International Journal of Computer Science and Mobile Computing, Volume 3, Issue 12, December 2014, Pages 176 – 180