Decision Making by Driver to Overtake Based on Intelligent Transportation System

TeerthanandaSagar C S, M Maneela, Praveen K, Sharon Raphella W, Masthanvali M R, Archana R, Ashwini B S

Dept. of Civil Engineering
Dr.T. Thimmaiah Institute of Technology, Karnataka
maneela@drttit.edu.in

Abstract. Every year, death toll and severe injuries are caused by road accidents, and each year this number is growing swiftly. The road accident report for 2017-2018 reveals there were 4.6 lakh unfortunate incidences of road accidents [MORTH]. The key reasons of road accidents in India is drunk and drive, weather conditions, rash driving, overtaking, hairpin bend, road humps, etc. This complication will be solved up to some extent by diminishing strategies based on Intelligent Transport System (ITS). ITS is an advanced technology of telecommunication, information, sensing, and detecting, in all kinds of the transportation system. The project aims to prevent road accidents especially, concentrating on Decision making by a driver to overtake. To overcome these scenarios we propose a system that uses a sensor, LED lights, LED display, etc. This help in ensuring safe mobility and conveyance for providing smart traffic and transportation management.

Keywords: Road accidents, ITS, Sensor, Decision Making, Safety assistant, Warning lights.

1 Introduction

India's road network ranks second largest across the world. This road network transports 85% of country's passenger traffic. Due to swift growth of vehicles, it has subsequently intensified the rate of accidents. Accidents predominantly take place due to distracted driving, carelessness, breaking speed limits, lack of awareness.A considerable rate of 48,000 fatalities is caused by overtaking. In the existing transportation system, drivers are not able to decide or make decisions according to the situation.Thus, we have developed accordingly a model using ITS, where drivers can be cautious in advance. Our system uses distance display module. It is important for road authorities and road users. This system is most promising to reach the safety target.

ICASISET 2020, May 16-17, Chennai, India

DOI 10.4108/eai.16-5-2020.2304030

2 Literature Survey

Aravind B has illustrated on Sensor based accident prevention system, It alerts the driver about the vehicle coming from opposite side in a hairpin bend [1]. R.S. Rakul has illustrated on Implementation of vehicle mishap averting system using arduino microcontroller. This system prevents accidents by providing ultrasonic transceiver at hairpin bend [2]. T. Maris Murugan has illustrated on accident prevention system through ITS, when the speed exceeds its limit, it alerts the driver and controls the speed of vehicle by applying automatic brake [3]. KasraRezagholipour has illustrated on modeling and reducing overtaking accidents on two-lane curved roads. This system uses intelligent barrios to reduce accident rates [4]. Nishant Raj Kapoor has illustrated on Study of Intelligent Transportation [5] system in India, this paper attempts to propose different human relevant ideas in Indian ITS [6].

3 Methodology

The obstacle detection and display unit for safe overtaking is given in fig1.

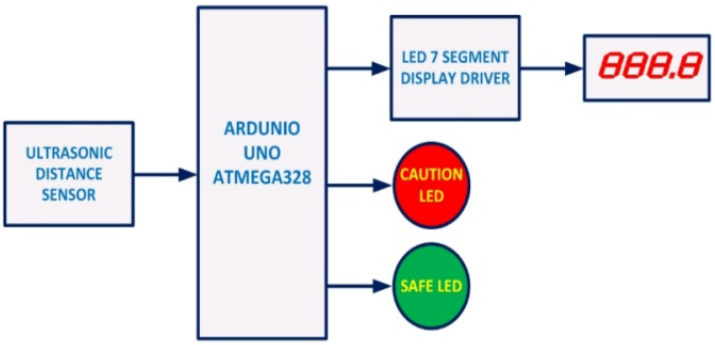

Fig 1: Obstacle detection and display unit

HC-SR04 is an ultrasonic distance measurement sensor which is used in the proposed project to detect vehicles in the front, the information from HC-SR04 is processed by Arduino UNO which converts the data received by HC-SR04 into human readable format and displays it using a LED seven segment display driver circuit and LED seven segment displays. Arduino also compares the distance with a threshold and indicates whether it is safe to overtake or not by means of two LED's (RED & GREEN) RED LED indicates caution and GREEN LED indicates safe to overtake.

4 System Design

The ultrasonic sensor produces a 40 KHz ultrasonic sound wave when triggered with a pulse of 10µs at TRIG pin and if it encounters any object within 30ft range it sends a signal at the ECHO pin. The ultrasonic sensor is connected to arduino UNO

[7][10]were TRIG becomes OUTPUT and ECHO becomes INPUT to the arduino UNO. UNO triggers the ultrasonic sensor with a 10µs pulse at TRIG pin and starts the internal counter to track the time until it receives a signal from ECHO pin. If a signal is received from ECHO the counter halts and divides the time/2 to get the actual time using the formula [8][9]

D= Time * speed of sound in open air, the distance is calculated. Where, speed of sound wave in open air is 343m/s.The UNO displays the distance using two LED seven segment displays. UNO cannot drive the LED seven segment displays since they require current more than 20mA to glow hence, two drivers (current amplifier) ULN2003 are used to amplify the current before connecting them to LED seven segment displays.

4.1 Circuit diagram for obstacle detection and display unit is given in fig 2.

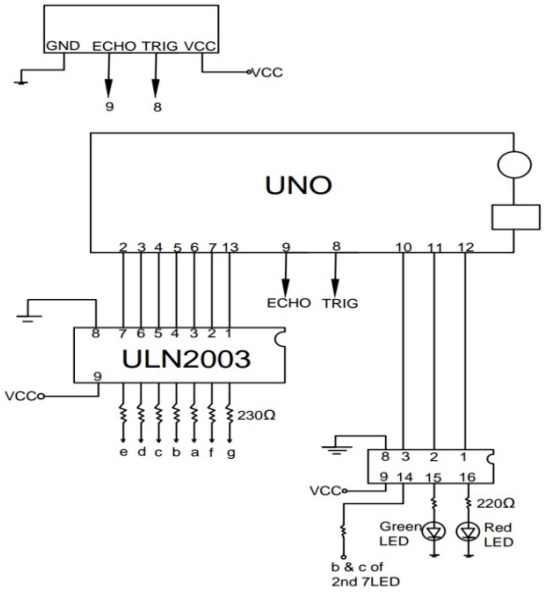

Figure 2: Circuit diagram for obstacle detection and display unit

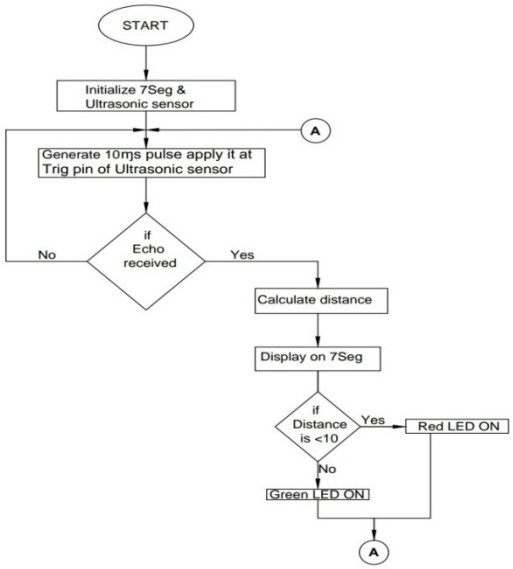

Figure 3: Flow chart for obstacle detection and display unit

4.2 Flow chart for obstacle detection and display unit is given in figure 3.

We have used AutoCAD for simulation of the circuit. The flowchart commence with START and it initializes 7 segment and ultrasonic sensor which further generates 10µs pulse which applies at TRIG pin of ultrasonic sensor.If echo is not received it goes back to previous step for generating pulse. If echo is received, it calculates distance and displays it on LED 7 segment display. If the distance is less than 10ft it is not safe to overtake hence, RED LED glows. If the distance is more than 10ft it is safe to overtake hence, GREEN LED glows. Same procedure is repeated again and again.

5 Experimentation And Results

STEP 1: The Arduino UNO can be programmed with the Arduino software. Select "Arduino UNO from the Tools> Board Menu (according to the microcontroller on your board) as shown in fig 4.

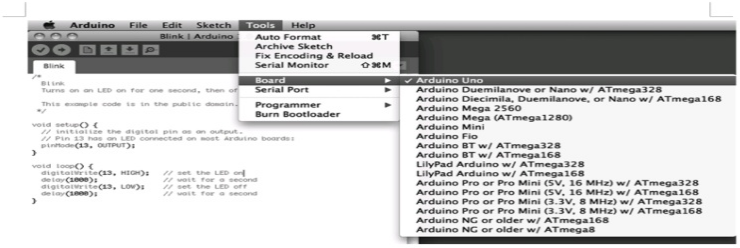

Fig 4: Programming With Arduino Software

STEP 2: Circuit connection having ultrasonic sensor, arduino UNO and LED seven segment display where the sensor senses the obstacle and the arduino UNO processes the information and displays distance and operates LED as per the commands as shown in figure 5.

Figure 5: (Left to right) Circuit connection for Distance display unit,Distance Display Module ,RED & GREEN LED indications

STEP 3: If the ultra sound pulse encounters any object, all the pulse reflects back as an echo. The echo is the input for arduino UNO where it processes the information and displays it on LED-7-segment display as shown in figure 6.

STEP 4: Output is achieved for the objective i.e. RED LED glows when the distance between the vehicle and obstacle is below 10ft which means it is not safe to overtake and GREEN LED glows when the distance between the vehicle and obstacle is more than 10ft which means it is safe to overtake as shown in figure 7.

5.1 Advantages

Ultra sound wave is not affected by the environment.

- Since all the vehicles have sound in the range of 20Hz to 20K Hz, the receiver in ultrasonic sensor won't receive sound waves from vehicles.
- LED-7-segment display is low power consuming.

- Very less programming is needed for LED-7-segment display.
- Sunlight won't affect the LED-7-segment display.
- Cost of LED-7-segment display is cheaper compared to other displays.

6 Conclusion

The maximum fatalities occur due to overtaking. So, the real-time information about traffic is provided, which helps the driver in deciding to overtake. This driver assistance system consists of an ultrasonic sensor, LED-7-segment display, LED lights which performs accurately as shown in the experimental results. The effective methodology of this system will intimate the driver to have a better sense in advance, which will swiftly reduce accidents due to overtaking. The authorization of ITS in vehicles and traffic management systems continue to show drastic improvement in safety of people. It's is very predominant in the growth of the transportation system. The project has a very vast scope in the future. The addition of the latest techniques will make ITS more efficient in preventing road accidents. Every country wishes to make its roads as safe as possible. So, automotive technologies will be promoted. To implement this system on a larger scale, further pilot studies can be done and if that works, the government should make policy for vehicle manufacturers to adapt this system mandatorily.

References

1. Aravinda B, Chaithralakshmi C, Deeksha, Ashutha K, "Sensor Based Accident Prevention System" IJIREEICE Vol.4. Issue 6, June 2016.
2. R.S. Rakul, S. Ravia, K.N. Thirukkuralkani, "Implementation of Vehicle Mishap Averting System Using Arduino Microcontroller" IJERT, ISSN: 2278-0181, Vol 5, Issue 4, April 2016.
3. T. Maris Murugan, Dr. M. Kandasamy, G. Revathy, "Accident Prevention System through Intelligent Transport System" (SSRG-IJIE) - Vol 4 Issue 1, Jan-April 2017.
4. KasraRezagholipour, NeginMassoudian, Mohammad Eshghi, "Modeling and Reducing Overtaking Accidents on Two-Lane Curved Road" Research Gate DOI: 10.1109, Dec 2016.
5. Nishant Raj Kapoor, AvinashBaghel, Himanshu Sharma, VikramDubey, "Study of Intelligent Transportation System in India" IJRSE, ISSN 2319-8354, Vol No. 6, Issue No. 10, October 2017.
6. S. S. Thouheed Ahmed, K. Thanuja, N. S. Guptha and S. Narasimha, "Telemedicine approach for remote patient monitoring system using smart phones with an economical hardware kit," 2016 International Conference on Computing Technologies and Intelligent Data Engineering (ICCTIDE'16), Kovilpatti, 2016, pp. 1-4, doi: 10.1109/ICCTIDE.2016.7725324.
7. Ahmed, S.T., Sankar, S. & Sandhya, M. "Multi-objective optimal medical data informatics standardization and processing technique for telemedicine via machine learning approach". J Ambient Intell Human Comput (2020). https://doi.org/10.1007/s12652-020-02016-9

8. Kumar, S.S., Ahmed, S.T., Vigneshwaran, P. et al. “Two phase cluster validation approach towards measuring cluster quality in unstructured and structured numerical datasets”. J Ambient Intell Human Comput (2020). https://doi.org/10.1007/s12652-020-02487-w
9. R. Joseph Manoj, M. D. Anto Praveena, K. Vijayakumar, “An ACO–ANN based feature selection algorithm for big data”, Cluster computing, Springer, march 2018.
10. Dafni Rose J, Vijayakumar K, “Data Transmission Using Multiple Medium Concurrently”, IJET, 2018.