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VEHICULAR SENSING AND AUTOMATIC BRAKING FOR ACCIDENT AVOIDANCE ON T JUNCTIONS AND BLIND CURVES

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Abstract

The concept of safety and security on road traffic is a much larger issue which concerns many in the recent years, as the rate at which accidents occur is increasing continuously which is leading so many accidents and loss of human life. Since the number of vehicles used in road transportation is increasing in huge proportions, it has been a much larger problem to make way for effective traffic control for accident avoidance. The main objective of this study is to further improve safety in terms of road transportation by providing immediate and continuous alerts to drivers about hazards in their path mainly in invisible areas like blind curves and T junctions. This information about the vehicular arrival on one side of the lane is projected to the vehicles on the other side of the lane or curve to avoid collision and accidents.

Key Words:Vehicle sensing, distance estimation, alerting signal, Automatic braking.

1 Introduction

The objective of the proposed work is to reduce the number of accidents that happen due to the unseen vehicles which are approaching on the other end of the blind curves, merging lanes etc. Mainly speaking about the condition in many places in India we have numerous merging lanes and junctions in which the vehicles which are approaching is not visible to the vehicles on the other end of the lanes which leads to accidents. In highways and hilly areas blind curves cause a major amount of accidents. Thus the main objective of the project is to make the vehicles on the other end of merging end or blind curves or junctions to be aware of the upcoming vehicles on the other side of the road and apply automatic braking in conditions of closer proximity in order to avoid collisions and accidents.

A) Problem Statement

Anticipating a vehicle or many vehicles in a blind curve or merging lane is not an easy task but demands a lot of alertness and actually it is an art to come out successfully at crucial times. The drivers have to be alert and agile at all times. His sensory organs had to work overtime for a quick response during the times of danger. Especially during the wee hours where the expectancy of vehicles is less, over- speeding takes place leading to the occurrence of accidents. .

Figure 1. Accident in Junction

B) Approach to the Solution

This paper brings out a solution by placing an interface in the form of signal lightings between the vehicles on either side of the road which are invisible to each other to reduce the burden on the drivers with the need to anticipate the approaching vehicle or vehicles. If the driver on one side of the road is intimated about the arrival of vehicle on the other side he may be cautious about his driving. In extreme cases where the person fails to notice the intimation this project proposes automatic breaking or stopping of the vehicle to prevent accidents.

2 Existing System

Accidents mainly occur due to over speeding of vehicle while negotiating a sudden curve or intersecting roads or junctions where the arrivals of vehicles are not known until they reach the junction. The driver loses control of vehicle hence leading to accidents. The following methods are currently being followed in blind curves, merging lanes and junctions while negotiating a curve.

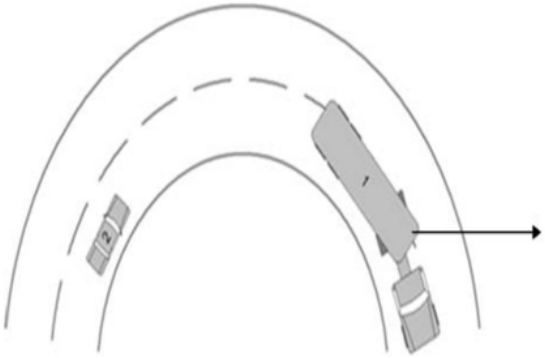

Figure 2. A blind curve

A) By means of horn in vehicles

In blind curves and merging lanes while negotiating a curve vehicle around the curves are identified by means of vehicle horn. The driver can only judge by his skills if the vehicle around the curve is nearer or far away. This method is currently being followed and the driver has to continuously horn at every curve no matter if the road is widely used or not. Sounding is an efficient way in identifying vehicle but it can lead to much confusion between drivers and it is based on approximate judging of the vehicular distance and leads to danger if not followed by the driver. In places like India where T junctions and curves are maximum in number, people feel lazy to horn in every curve and junction and thus lead to accidents.

B) Concave mirrors around blind curves in hilly areas

In most of curves in hilly areas concave mirrors are placed in order to find the arrival of the vehicles on the other end. The concave mirror has to be kept always clean and clear so that it is visible all time clearly. But in hilly areas the climate is always misty and snowy. Hence these concave mirrors are not visible at poor weather conditions and gets covered with mist. By using concave mirror, type of vehicle and vehicle distance cannot be clearly figured out properly.

C) Head lamps for alerting during night time

During night in curves, by dimming and brightening vehicles head lamps driver can caution the vehicles which are approaching on the opposite side. But this system is only useful at night but in the day light conditions it is not of use.

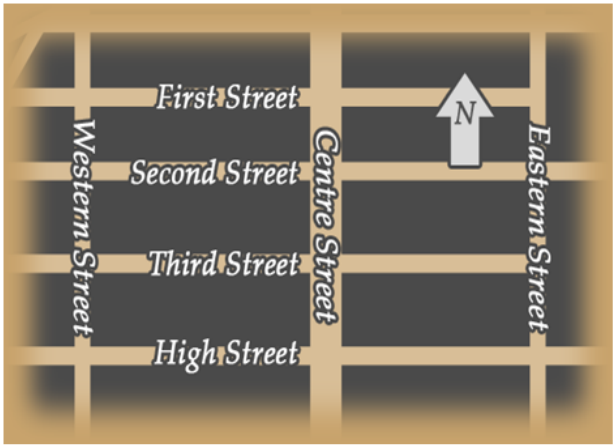

Figure 3. Merging Roads

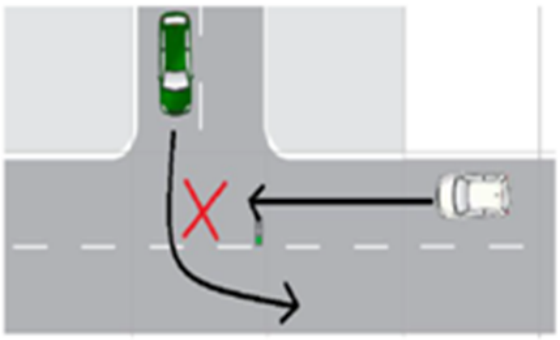

Figure 4. Accident in T junctions

3 Proposed System

A) Vehicular Sensing Design

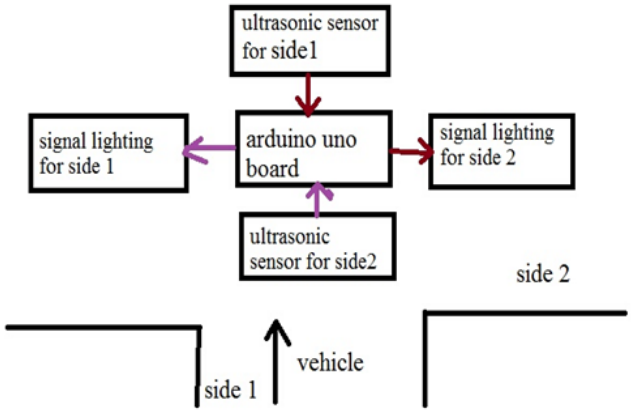

Figure 5. Vehicular sensing design

This is to find the approach or non-approach of a vehicle on any side of a merging lane or blind curve. This approach or absence of vehicle or vehicles is intimated to the drivers by means of signals where a red signal indicates the approach of vehicle or vehicles on the other side of the lane while a green light indicates that no vehicle is approaching on the other side and he is safe to proceed.

B) Automatic Braking:

This is used in situation wherein the driver doesnt notice the signal intimation of the upcoming vehicle approaching on the other end of the junction or blind curve or continues irrespective of noticing. The sensors detect the distance between the vehicles and if they approach close proximity without stopping the system automatically stops the vehicle from further proceeding until the vehicle crosses the junction. Once the vehicle crosses the junction or merging lanes or blind curves the vehicle shall automatically be switched on and can proceed further.

C) Overall Block Diagram of the Idea of the Project

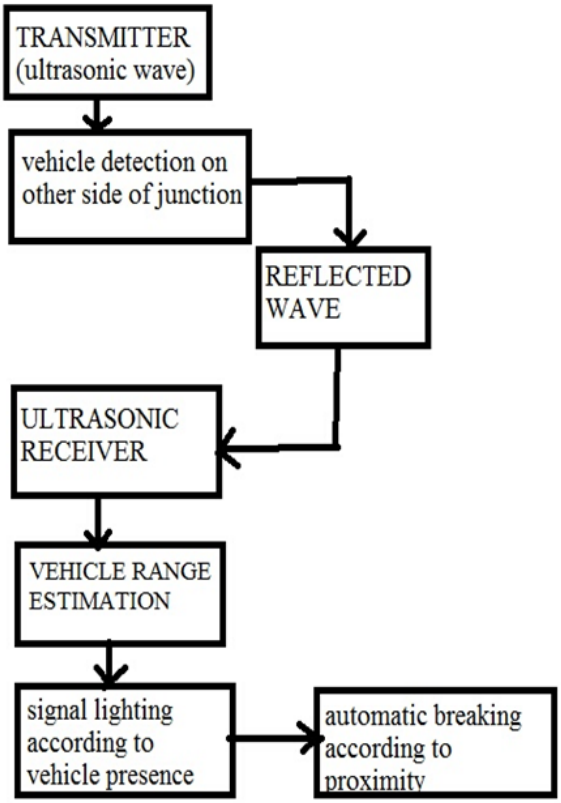

Figure 6. Flow diagram

Ultrasonic sensors are placed on either side of the blind curve or T junction to sense vehicular presence. The waves reflected from the vehicle are sensed by ultrasonic receiver and are utilised by the arduino board to light the red signal on the other side of the blind curve or T junction to indicate the arrival of vehicle on the this end to avoid accidents. If the vehicle approaches closer to the junction as an implication that the driver has not seen or neglected the signal automatic braking is done to avoid the impending collision and accident. Only if the distance between the vehicles is too closer such that accident might occur automatic braking is activated. To prevent the vehicle coming at the rear side of the automatically braking vehicle to collide with it in addition to the signal lighting a light is placed on the rear side of the vehicle. This light is activated

few seconds prior to braking to intimate the vehicles on the rear side that the vehicle might stop.

4 Components Required

a) Arduino UNO:

The Arduino UNO is a microcontroller board with the implementation of ATmega328. 14 digital Input /Output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, USB connection, a power jack, an ICSP header and a reset button has been used here. It is provided with everything needed to support the microcontroller. Simply connect it to computer with a USB cable or power it with an AC-to- DC adapter or battery to get started. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

b) Ultrasonic Sensor:

Ultrasonic sensors (also known as transceivers when they both send and receive, but more generally called transducers) works with the same principle as that of a radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves by which the echo that is received back by the sensor is evaluated. Also the time interval between sending the signal and receiving the echo to determine the distance to an object is calculated using the sensors. Systems typically make use of a transducer to generate ultrasonic sound waves of the range, above 18,000 hertz. This is done by converting electrical energy into sound, then upon receiving the echo convert the sound waves into electrical energy which can be measured and displayed.

c) Xbee Module:

XBee is a wireless communication module with 802.15.4/ZigBee standard. The ZigBee wireless standard is capable of forming self-healing mesh networks. XBee and XBee-PRO 802.15.4 OEM RF modules are embedded solutions which gives wireless end-point connectivity to the devices. These modules make use of the IEEE

802.15.4 networking protocol for fast point-to- multipoint or peer-to- peer networking. They are designed to work on high-throughput applications which require low latency and predictable communication timing. Xbee modules are perfect for low-power, low-cost applications.

d) L293D motor driver:

The Motor Driver is a module used in the motors that allows you to control the speed of working and direction of two motors simultaneously .This Motor Driver is developed based on L293D IC. L293D is a 16 Pin Motor Driver IC. This is designed to give bidirectional drive currents at voltages from 5 V to 36 V.

e) LEDs for signal lighting:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a pn junction diode, which when activated, emits light. When a suitable voltage is applied to the leads, electrons can recombine with electron holes inside the device, releasing energy in the form of photons. This effect is known as electroluminescence, and the energy band gap of the semiconductor determines the color of the light (corresponding to the energy of the photon).

5 Block Diagram

The signal from the ultrasonic transmitter are sent, reflected from the vehicle(if any) and are sensed by the ultrasonic receiver. This information is sent to the arduino board which lights the red signal on the other end of the blind curve or T junction to indicate the arrival of the vehicle on this end. The distance between the signal and the vehicles are calcuated and if the proximity is closer bits are sent from the xbee transmitter and received by the xbee receiver in the vehicle. After the reception of data from the xbee receiver the light at the rear side of the vehicle glows and a few seconds later the L293D motor driver brakes the wheels of the car or bike to prevent potential accidents.

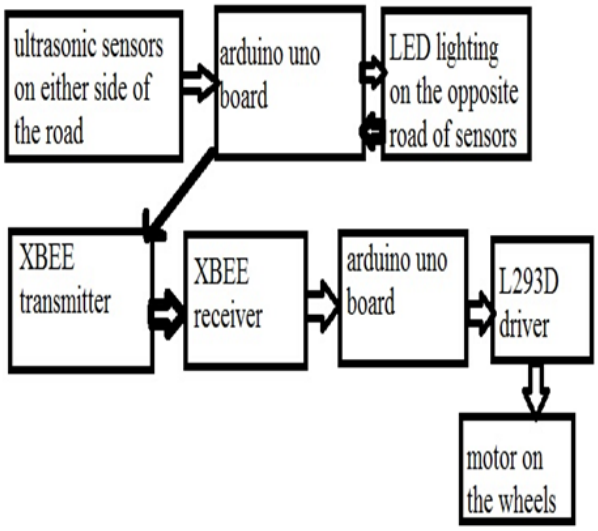

Figure 7. Overall block diagram

6 Outcome

If the above system is implemented the accidents due to non-anticipation of the vehicle arriving on the other invisible side of the blind curves or T junctions or wrong estimation of the distance of the upcoming vehicle could be greatly avoided. Since the arrival or non-arrival of vehicles on the other side of curves or junctions is explicitly made known in the form of signal lightings, it prompts the driver to be cautious in his driving. Even in the absence of the proper noticing of the signal lighting or ignorance of the signal lighting automatic braking helps in the prevention of accidents thus saving lives.

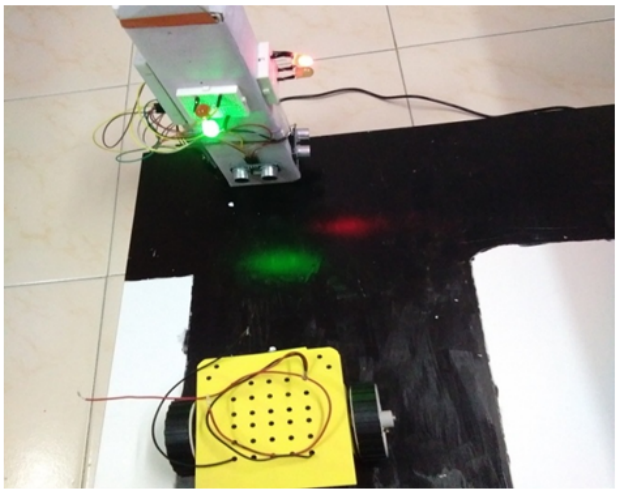

Figure 8. Implementation of the project on vertical part of T junction

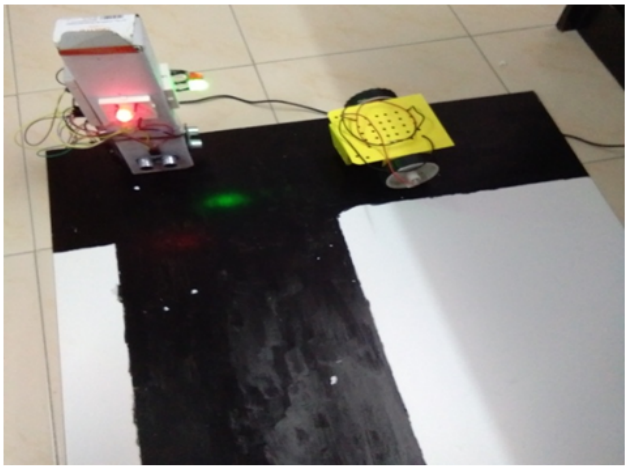

Figure 9. Implementation of the project on horizontal part of T junction

7 Conclusion

The above proposed system overcomes the problems of anticipation of vehicles on the other end of junctions, merging lanes and blind

curves. The braking system has to be implemented in all the vehicles and these signals intimating the arrival of vehicle on the other sides of merging roads and blind curves should be implemented in the real time covering the above mentioned concepts. Thus this project gives a very simple and cost effective way of implementation in roads which is highly in use to avoid accidents at the blind curves as well as merging lanes. This project alerts the user of the impending danger of collision of the vehicle with the upcoming vehicle from the other end and also implementing automatic braking under difficult conditions. Thus by effective implementation of this project accidents across junctions, merging lanes and blind curves can be reduced to a very high extent and thus saving human power.

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