

Smart Zebra Crossing

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Abstract -- This paper presents the usage of ultra-sonic sensors and Arduino UNO beside zebra crossing, which can stop an individual from breaking traffic rules. People often avoid zebra crossing lines and try to cross them when the signal is red, which leads to significant accidents various times. These problems happen because people know that they will not be charged with any penalties for this cause until something serious occurs, which is a big drawback. People who break this rule cannot be identified easily by the concerned traffic officer. Hence to overcome this significant problem, we are planning to add ultra-sonic sensors by the sides of the road, which will detect the vehicle's presence on the zebra crossing when the signal is red, which indeed will send the signal to the buzzer. It will beep, and hence the concerned officer can chalan the guilty for his cause.

Keywords - Buzzer, LED, Traffic signal, Ultrasonic sensor, Zebra crossing.

I. INTRODUCTION

Due to a massive rise in automobiles and disorganized traffic management, we face many traffic problems in cities across India. The inappropriate city planning, the rapid increase in population, urbanization, and limited road capacities in significant cities, has expanded this matter. A considerable number of police officers must spend their time on traffic controlling which is inefficient and a wastage of human resources. Simultaneously pedestrians become the deciding factor for traffic congestion.



Fig.1 Zebra Crossing

Even though there are many pedestrian crossing mechanisms available, they are not ideal and secure for elders and children. Time taken to cross the zebra line may vary for children, the disabled, sick, and older people. Thereby the vehicles will have to halt in front of the zebra lines for a longer time which may cause substantial vehicle queues all along the streets. Pedestrians will have to wait for the vehicles to stop for crossing the street. The amount of time will be reduced by using some smart mechanisms. Unfortunately, our citizens do not follow the traffic rules, which can hamper pedestrians' safety. To ensure pedestrians' safety and to modify road management in a better and secure way, we are proposing a mechanism called 'smart zebra crossing'. The smart zebra crossing mechanism will guide the pedestrian to cross the road safely. If any vehicle crosses the ultrasonic safety sensor, a buzzer will beep, and which will notify the presence of the vehicle to the concerned traffic officer, which will ensure the safety of the pedestrian and the implementation of the traffic law.

II. LITERATURE REVIEW

[1]"Technology & Innovation: Sensors & IoT" (from International Research Journal

on Feb 2019) Uses the feeds from the CCTV camera on the traffic signals to generate the challan and then sent it to the owner of the vehicle when a crime is detected using the sensor installed on the road.

[2]"Smart Traffic Signal Using Ultrasonic Sensor" (from IEEE International Conference on Green computing, communication, and electrical engineering in March 2014) Uses a microcontroller and an ultrasonic sensor to detect a violation of traffic rule to get evidence like pictures, location time etc. of the crime which can be later used to generate chalan against the culprit.

[3]"An Automated Zebra Crossing using Arduino-UNO" (a research paper by the BRAC University students) provides an automated road crossing system using parameters required in the system, which ultrasonic sensors will measure.

[4]"Automated, low-cost pedestrian crossing carriage for efficient traffic control and pedestrian safety" (a research paper by the students at the University of Kelaniya, Sri Lanka.) have proposed a self-driving pedestrian carrier is designed to transport pedestrians across the road automatically.

[5]"Pedestrian-safer IoT-based Smart Crossing System with Object Tracking" (from International Journal of Recent Technology and Engineering (IJRTE) and Published by Blue Eyes Intelligence Engineering & Sciences Publication) uses Ultrasonic sensors and one IR sensor for measuring the parameters needed for the Arduino UNO R3 to form a pedestrian-safer IoT-based smart crossing system with object tracking

[6]"Design and Development of a Pedestrian Controlled Stop Light" (from International Journal of Emerging Trends in Engineering Research dated 7th July 2020) uses an Arduino as microcontrollers and an

ultrasonic sensor to make a smart pedestrian-controlled traffic light constructed to aid pedestrians crossing while causing a less negative impact on the traffic of the location.

[7]"A Proposed Design of Traffic Congestion Prediction Using Ultrasonic Sensors" (from International Journal of Applied Engineering Research) In this research, the students have designed a tool that will provide the data that a system can process to determine the state of the road, which is used to provide real-time information to road users.

[8]"Technologies for automated pedestrian detection at signalized intersections" (a research paper by a student of the University of Manitoba Transport Information Group (UMTIG)) which provides an environmental scan is to obtain an understanding of current technologies used for the automated detection of pedestrians at signalized intersections.

[9] "Object Detection Using Ultrasonic Sensor by Arun Francis G, Arulselvan M, Elangkumaran P, Keerthivarman S, Vijaya Kumar J in International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6S, April 2019." This research will help to detect the presence of object with help of Arduino and ultrasonic sensor which they further connected to RADAR which is helpful for Navy and various fishers.

[10] Pedestrian Crossing Safety System at Traffic Lights based on Decision Tree Algorithm, by Denny Hardiyanto¹, Muamar Rojali⁴ Department of Electrical Engineering Institut Sains and Teknologi AKPRIND Yogyakarta Yogyakarta, Indonesia^{1, 4} Iswanto², Dyah Anggun Sartika³ Department of Electrical Engineering, Universitas² Muhammadiyah Yogyakarta, Yogyakarta, Indonesia Department of Computer Control

Engineering, Politeknik3 Negeri Madiun, Madiun, Indonesia, in (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 10, No. 8, 2019. In this research it is proposed that with the help of decision tree algorithm they will ensure the safety of Pedestrians by spraying water at the vehicle driver who tend to break the traffic signal.

III. SYSTEM DESCRIPTION

The proposed system has two main components used the ultra-sonic sensor and Arduino UNO. It even consists of a buzzer, and a round LED consisting of colours green, yellow, and red.

Fig.1 illustrates the Block Diagram of our proposed model, Fig. 2 illustrates the flow chart of our model. Fig. 3 illustrates the circuitry behind the whole system.

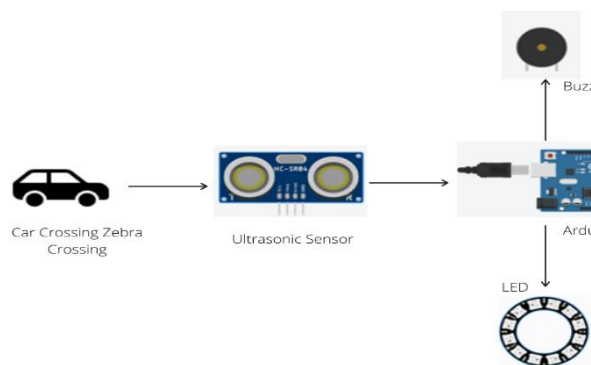


Fig.2 Block Diagram

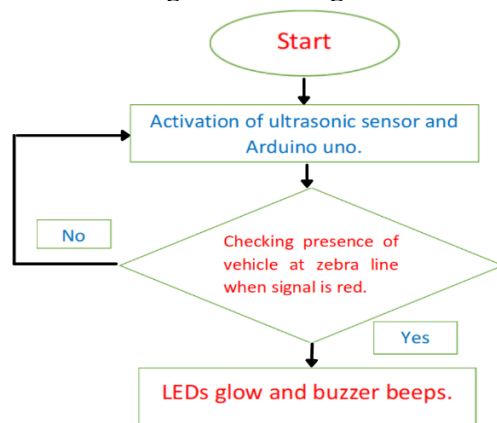


Fig.3Flow Chart

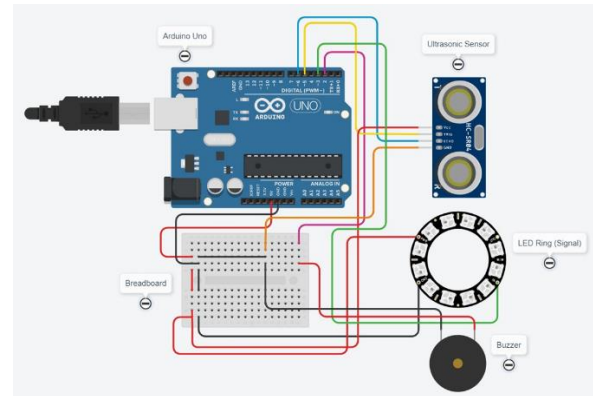


Fig.4 Circuit Diagram

IV. HARDWARE ARCHITECTURE

A. Arduino Uno

Arduino is a very important devices used in electronics. It is an open-source platform used for building various of electronics projects. Arduino initially consists of a physical programmable circuit board, often referred as microcontroller and a piece of software, IDE Integrated Development Environment that runs on your computer, which is used to write and upload computer code to the physical board.

The Arduino platform is very important and popular among the people who are related with electronics department. Unlike other previous programmable circuit boards invented, the Arduino doesn't need to have a separate piece of hardware, called a programmer to load new code onto the board mostly its uploaded with the help of UBS cable. The Arduino IDE uses a simplified version of C++, which makes it easier for the user to learn to program. Finally, Arduino provides a standard form factor that breaks out the microcontroller's functions into a more accessible package.

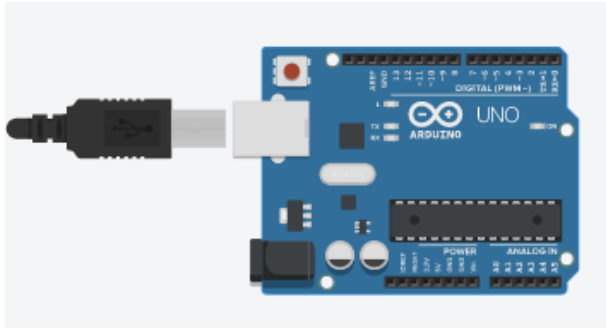


Fig.5 Arduino

Arduino Uno has a microcontroller board which based on the ATmega328P . It has around 14 digital input/output pins (out of which 6 pins can be used as PWM outputs), 6 analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains mostly everything which is needed to support the microcontroller, connect Arduino Uno to a computer with a USB cable or power it with an AC-to-DC adapter or battery.

B. Ultrasonic Sensor

An ultrasonic sensor is an electronic device that is used to measures the distance of any target object by emitting ultrasonic sound waves and convert the reflected sound into an electrical signal. Ultrasonic waves travels faster than audible sound speed i.e., the sound that can be heard by humans. Ultrasonic sensors contains two main components: the transmitter, which emits the sound using piezoelectric crystals and the receiver, which encounters the sound after travelling to and from the target.



Fig.6 Ultrasonic Sensor

To calculate the distance between the sensor and the object, the sensor measures the time taken between the transmitter's emission by the transmitter to its contact with the receiver. This calculation formula is $D = \frac{1}{2} T \times C$ (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. They are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat).

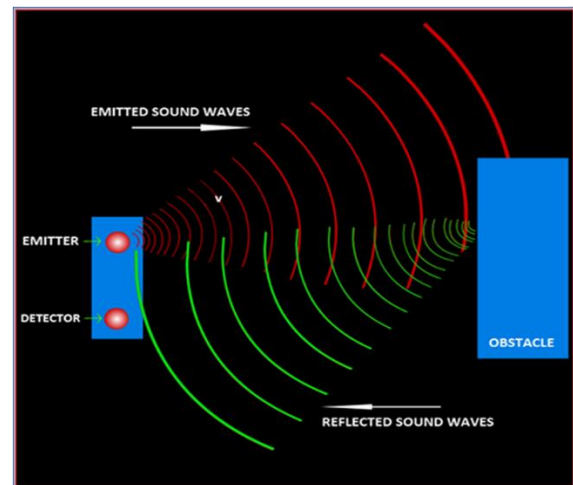


Fig.7 How Sonic sound waves work

Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories). Most notably, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumours, and ensure babies' health in the womb.

V. CONCLUSION

In this research work, a safe and user-friendly design for the zebra crossing system is introduced. The automation of this system depends entirely upon the characteristics of the road and the area. This system removes the risky business of road crossing in a minimum and cost-effective way. Also, the system's simplicity gives value to it to the point that it becomes a demanding project for the areas where traffic rules are hardly followed. This idea can even be used to reduce the number of traffic police at every signal. This system is highly recommended for public locations. The implementation of ultrasonic sensors in the system adds to its effectiveness compared to the existing automation of such a system. It is hoped that the issues and risks involved during the road crossing will be removed due to this project's implementation.

VI. LIMITATIONS

The model won't be able to detect the presence of any emergency vehicles such as Ambulance, Fire brigades, etc and hence the buzzer will beep if the vehicle crosses the zebra crossing at the time of emergency.

VII. FUTURE SCOPE

We are planning to merge this project with camera which will be having a 24x7 surveillance over the city, will be helpful for the police department to locate whether there is any masacara occurring around the city.

VIII. ACKNOWLEDGMENT

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