

Multi Modal System for Safety on Railways

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Abstract:- Transportation networks are one of the most important aspect for economic development of a country. Accidents in railway leads to loss of lives and financial loss for the government. Modern railway transport systems are designed under the principles of safety and reliability, and the development of high-speed railway lines is based on such premises. This project is designed based on railway safety. Here we propose a system which consists of ultrasonic sensor, camera, GPS, and GSM. This project describes a camera with MATLAB software which is used in integrating visuals and programs. This also gives a graphical user interface for this model. This helps us to detect an object on the track, thus giving us the image of the hindrance on the track. GPS are used here to get the location and GSM are used here as a communication channel to transmit GPS coordinates, like geography location.

I. INTRODUCTION

Railway transportation is known as the backbone of Indian economy. Safety on railway networks has to be maintained for the security of the people is guaranteed. Several monitoring system such as stereo visions, thermal scanners, and vision metric etc., are used in monitoring platforms. But they could not achieve the goal by detecting the obstacle on the tracks. The obstacle may be fixed or mobile. Though there is technological development today, the obstacle detection is done using man power. This consumes a lot of time, money and man power. The task is also difficult task for them.

The structure and performance of transportation network reflects the ease of travelling and transferring goods among the different parts of a country thus affecting trade and other aspects of country's economy.

II. ANALYSIS

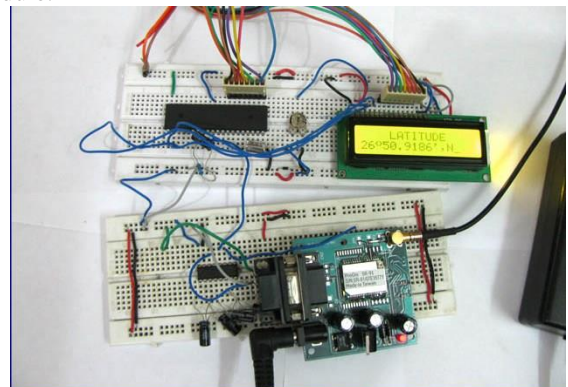
According to the statistics, signal system failures, track failures, vehicle breakdown are some of the cases in which major train accidents occurs. Obstacle on the train tracks is the most important reason. The obstacle may be any vehicle, animals and humans crossing the track and also in some cases any cracks on the rail tracks.

Around 15,000 lives are lost due to rail accidents every year. The unmanned crossings are responsible for maximum number of train accidents in India.

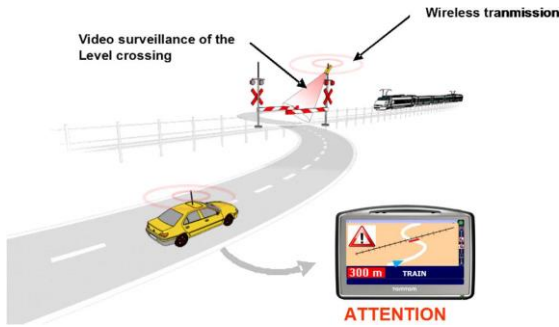
In all transport systems safety and reliability are highly considered, particularly in railways. In Railway System all the control are done through man power. In this present condition we have faced the following problems wastage of time, wastage of energy and difficulty for a manual operator. Because of the constant need to improve rail safety, the existence of the objects on tracks are considered, particularly the grade crossings. In the existing system, the chance of false alarm creation is high. This cause financial losses to the government.

LITERATURE SURVEY

Juan Jesús García et al [1] designed a system of barrier for safety enhancement in railways. This consists of Infrared sensors and ultrasonic sensors. Two barriers are created, one for emitting purpose and the other for receiving purpose. The sensors produce signals at frequent intervals. The obstacle is detected when the signal is created abnormally. Thus the location is detected using GSM-GPS module.



Houssam Salmane et al [2] has proposed a system in which the situations or the events which has turned out to be abnormal like accidents due to vehicles, pedestrians are captured through the Level crossing environments. That is the video of level crossings where the movement is identified and the situation is evaluated automatically such that if the situation where accident could take place is detected, a remainder is given. This system works for only a particular zone.



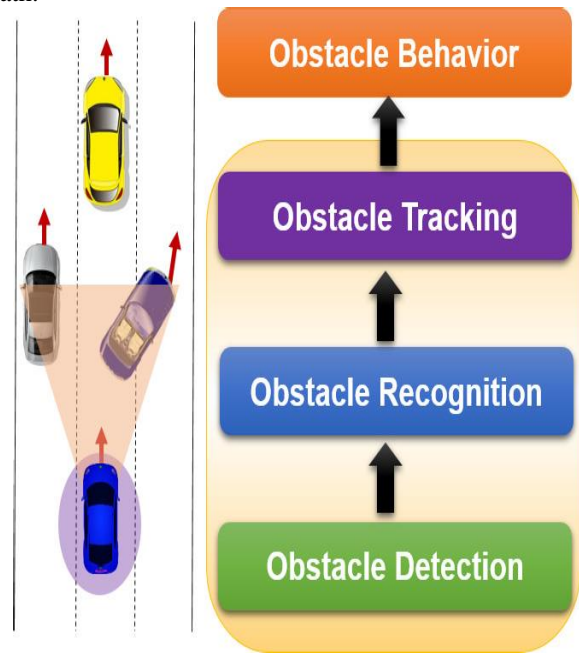
Saikat Ray et al [10] proposed a system a framework for location detection by using the method of identification of codes. Constructing a framework with minimal number of sensors is equivalent to creation of optimal code which is of NP complete problem. This system was created mainly for the use in harsh environments. This produces an optimal solution for a wide range of parameters. This system does not need any central monitoring system.

Javier Hernández-Aceituno et al [8] proposed a method by which the user can know the definite obstacle that could be in their way in the navigation map used in the vehicle by prediction metod.



Vinh Dinh Nguyen et al [6] proposed a framework work detecting, recognizing and tracking the vehicles and the pedestrians by deep learning approach. This system gives

information on robust vehicle and humans crossing the path.

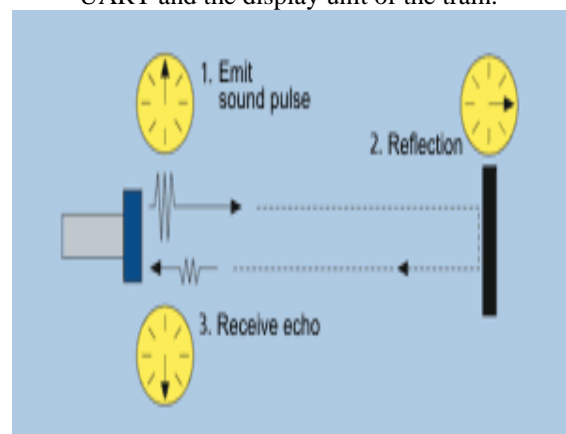


IV. PROPOSED SYSTEM

In proposed method we develop a safety system for railway and human beings. This system or the model provides a way in which accidents due to level crossings and also in the tracks can be avoided in a greater rate. The system consist of microcontroller which is interfaced with GPS module, GSM modem, Buzzer, Ultrasonic Sensor, and LCD display.

The Global Positioning System which is known to be one of the most successful mobile telecommunication is used such that it gives total mobility and high transmission rate.

The ultrasonic sensors sense the obstacle in front of the train and send information to the centralized server using UART and the display unit of the train.



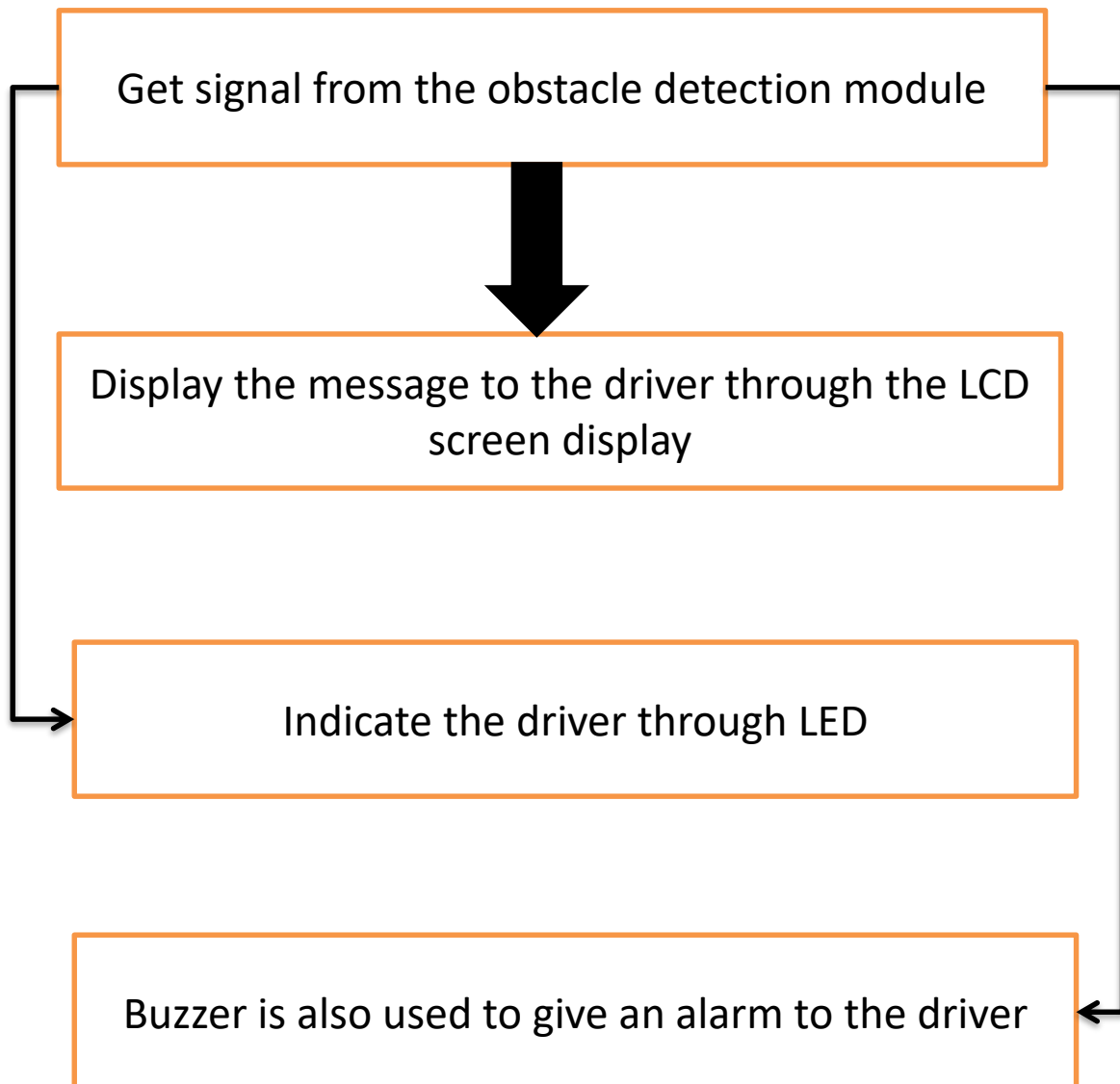
The above diagram shows the working of ultrasonic sensors where the sound pulse is given out by the sensors at a specific frequency and they receive the echo. Thus the distance is calculated by the time elapsed between generated and the received sound wave.

The camera along with the MATLAB capture the detected obstacle image in front of the train and check what type of obstacles are detected on the tracks and send the information of the detected obstacle image to the centralized server using UART. The Universal Asynchronous Receiver/Transmitter is a microchip with programming that controls the computer's interface with the serial devices. If any obstacles are detected in front of the train the GPS are used here to find the location of the obstacles detected train information, and GSM are used to send the location of the obstacle detected location information to the nearby railway station by using UART. Here MATLAB are used to check type of obstacle detected. Buzzer is also used here to produce alarm if any obstacles are detected in front of the train.

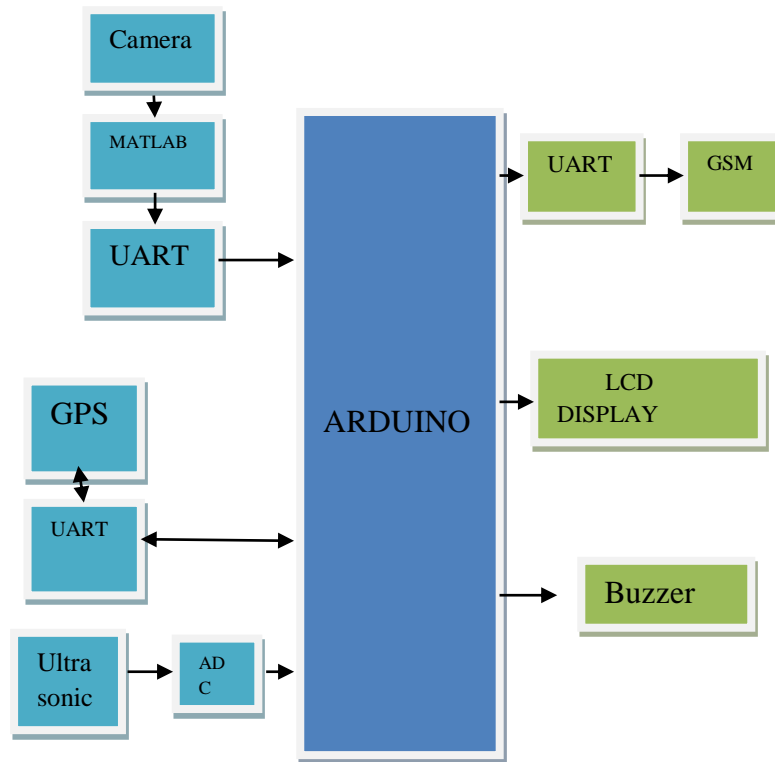
This system gives the video and images of the obstacles like humans, animals and vehicles crossing the railway line. The camera helps in capturing image of the obstacle on the train tracks. The system comes to a conclusion that the detection obstacle is human via face detection process whereas the animals and the vehicles are detected without providing any classification. Thus if the obstacles are detected then the system gives an image or the video through the LCD screen to the driver and also an alarm is produced by the buzzer.

ADVANTAGES:

- Avoid accidents at a greater rate
- Identify the obstacles and detects train location
- Reduce time to find the obstacles in front of the train instead of manual involvement in detecting it.



BLOCK DIAGRAM



V. CONCLUSION

Thus the proposed system helps in eradicating accidents due to humans, vehicles and vehicles crossing the tracks by using simple mechanism of obstacle detection.

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