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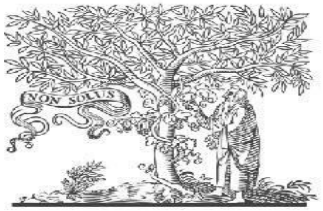

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Train Accidents Prevention Techniques

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Abstract

The use of ultrasonic sensors and buzzers has been proposed as a technique to prevent train accidents. The combined action of these two devices can provide early warning signals to the train driver, thereby helping to prevent collisions with obstacles or other trains on the track. This paper proposes a technique that uses ultrasonic sensors to detect obstacles on the track and then activates a buzzer to alert the driver. The system has been designed to be simple, low-cost, and reliable, with the potential to reduce the occurrence of train accidents. The effectiveness of the proposed technique has been evaluated through simulation and experimental studies, and the results show that the system can effectively prevent accidents by providing timely warning signals to the driver.

Keywords: Ultrasonic Sensors and Buzzers, Led Lights.

1.Introduction

Train accidents can have devastating consequences, and there is a constant need for innovative techniques to prevent them. One promising approach is to use sensors to detect obstacles on the tracks and alert the driver to take corrective action. In this regard, ultrasonic sensors have proven to be effective in detecting obstacles and measuring distances. By emitting high-frequency sound waves and calculating the time it takes for the waves to bounce back, ultrasonic sensors can accurately determine the distance between the sensor and the obstacle. When combined with a buzzer that can alert the driver, ultrasonic sensors can provide an effective means of preventing train accidents caused by obstacles on the tracks. In this paper, we propose a train accident prevention technique that uses the combined action of an ultrasonic sensor and a buzzer to prevent train accidents.

Another preventive measure, typically employed at train stations' platforms, keeps people from falling into the space between the ends of the platforms. We will discuss the technical aspects of this approach and how it can be implemented to improve train safety.

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2.Objectives

The primary objective of the proposed train accident prevention technique using the combined action of an ultrasonic sensor and a buzzer is to improve train safety by detecting obstacles on the tracks and alerting the driver to take corrective action. The specific objectives are,to design and develop an ultrasonic sensor-based system that can accurately detect obstacles on the tracks and measure the distance between the sensor and the obstacle.To integrate the ultrasonic sensor with a buzzer that can provide an audible alert to the driver when an obstacle is detected.To evaluate the performance of system in detecting obstacles on the tracks under various environmental conditions and at different speeds.Overall, the goal of this technique is to provide a reliable and cost-effective means of preventing train accidents and improving the safety of passengers and cargo transported by trains.

3.Block Diagram

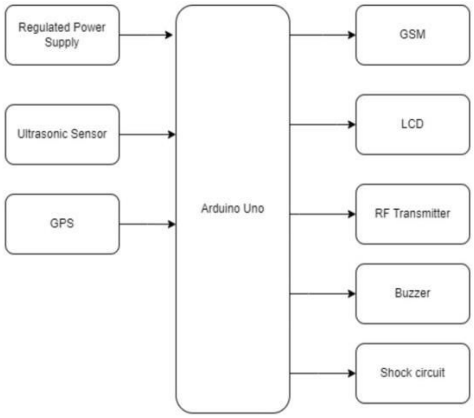


Fig.1. Block Diagram of Train Accident Prevention Technique.

Ciruit Connection

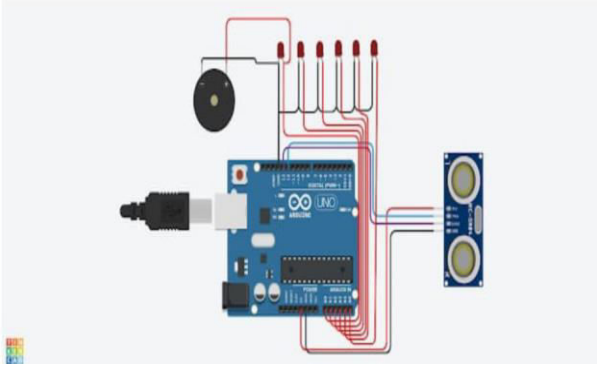


Fig 2: Overall circuit connection

Hardware Used

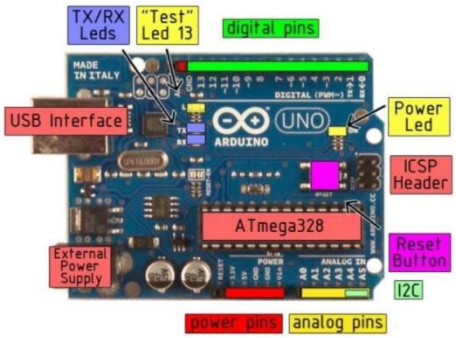


Fig.3. Arduino Uno Board

The ATmega328P microcontroller chip serves as the foundation for the Arduino Uno microcontroller board. In the family of microcontroller boards made by Arduino, it is a well-liked and often utilised board. The board is made to enable developing and prototyping diverse electronics projects simple for both experts and hobbyists. Its straightforward and user-friendly design enables users to get started on their projects right away without having to worry about intricate circuitry. The Arduino Uno board contains a 16 MHz quartz crystal, six analogue inputs, 14 digital input/output pins, a USB port, a power jack, and an ICSP header. The digital I/O pins have a wide

range of applications, including the management of LEDs, motors, and other electrical devices. The board can read from the analogue inputs. The board can read data from sensors that produce analogue signals thanks to the analogue inputs. Robotics, home automation, and internet of things (IoT) projects all make extensive use of the Arduino Uno board. It's a great option for both novices and experts because to its adaptability, simplicity of use, and price.

Ultrasonic Sensor

Fig.4. Ultrasonic Sensor

An ultrasonic sensor is a device that measures the separation between an object and the sensor using high-frequency sound waves. It operates on the idea that sound waves move through the air, hit an object, and then return to the sensor. By timing how long it takes the sound waves to reach the item and return, the distance between the sensor and the object may be determined.

Ultrasonic sensors are reasonably priced, trustworthy, and simple to use. They can function in challenging situations and are immune to electromagnetic interference. Yet, they have drawbacks such being susceptible to background noise and unable to detect translucent objects. Due to their adaptability and efficiency, ultrasonic sensors continue to be a preferred option for many applications despite these drawbacks.

LED

Light-emitting diode, or LED. When an electric current flows across it, the semiconductor gadget emits light. LEDs are solid-state devices that produce light using a process known as electroluminescence, in contrast to conventional incandescent bulbs, which produce light by heating a filament.

LEDs are renowned for being energy-efficient, having a long lifespan, and producing little heat. They are widely used in many different applications, including lighting, displays, and indicators. They come in a variety of colours and brightness levels. In addition to other items, LEDs are frequently utilised in electrical products, automobile lights, and traffic signals.

LED lighting is superior than conventional lighting in many ways. They are longer-lasting, use less energy, and produce less heat. Moreover, they are stronger and more vibration- and shock-resistant. Due to their low energy consumption, extended lifespan, and minimal maintenance requirements, LEDs are becoming more and more common in lighting applications.

Buzzer

Fig.5. Buzzer

When an electric current is passed through an electronic equipment, it emits a sound, or buzzer. This particular transducer transforms electrical energy into mechanical vibrations, which then result in sound waves. Piezo buzzers and magnetic buzzers are the two main types of buzzers. The piezoelectric material mechanically deforms as a result of the applied voltage when a voltage is placed across the two electrodes.The piezo disc within the buzzer moves to produce sound.Buzzers are an all-around convenient and efficient approach to deliver audible feedback in electrical systems and gadgets. Because to their affordability,simplicity, and dependability, they are frequently employed in a variety of applications.

DC Servo Motor

Fig 6:DC servo motor

An electric motor with accurate speed and position control is known as a DC servo motor. It operates under the tenet that the output of the motor is adjusted utilising a feedback control system depending on both the motor's actual position and the desired position. Rotor, stator, and a feedback control mechanism make up DC servo motors. While the stator is the motor's stationary component, the rotor rotates. The motor position is measured by the feedback control system's sensors and control electronics, which then modify the output. In a variety of sizes and power levels, DC servo motors are offered. Several control signals, including pulse-width modulation (PWM), analogue voltage signals, and digital signals, can be used to regulate them. Due to its strong torque at low speeds, DC servo motors are ideal for applications requiring great precision and accuracy.

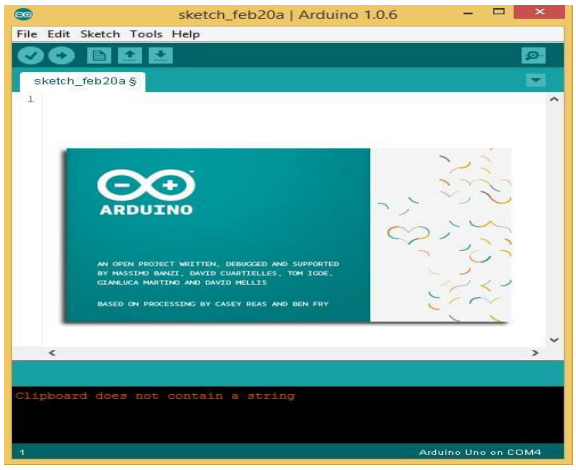
Jumper Wires

Jumper wires are a particular kind of electrical wire that are used to join electronic parts and gadgets. They are normally constructed of insulated copper wire, and both ends include connections that can be put into a breadboard, a circuit board, or other connector types. Male-to-male, male-to-female, and female-to-female jumper wires are just a few of the many lengths, colours, and configurations available. They are frequently used in electronic circuit development and testing because they

make component connections rapid and simple without the use of solder.

Jumper wires, in general, are a straightforward and adaptable tool used in electronics projects to link parts and devices together. They are frequently used by professionals, students, and hobbyists alike and are a necessary part of prototyping and testing electronic circuits.

Software Used :



Arduino Software:

For programming and developing applications for Arduino boards, there is open-source software called Arduino software. Its foundation is the Processing programming language, and it's made to make creating and programming microcontroller-based projects simple for both experts and novices.

Two key parts make up the Arduino software: the Arduino IDE and the Arduino firmware. The code that runs on the board and regulates its behaviour is called firmware, and it is written using the IDE, which is also used to write, compile, and upload code to the board.

A variety of built-in libraries and functions in the Arduino software make it simple to connect with a variety of sensors, actuators, and other devices. Additionally, it has a built-in bootloader that enables code to be uploaded to the board without the need for an external programmer, a serial monitor for debugging and testing programmes, and other features.

The user-friendly interface of the Arduino software, which includes a code editor with syntax highlighting, auto-complete, and other useful functions, is one of its primary characteristics. It also comes with Scratch, a visual programming language that enables beginners to create using blocks rather than text-based coding.

Setup():

Each Arduino sketch must contain a setup method:

1. Pin functionality utilising the pinMode()
2. Pinning in their initial stage
3. Prepare the classrooms.
4. Provide default settings for all variables.
5. Code that makes sense

Loop():

Every Arduino sketch must have the loop function, which is the primary function that gets called after setup(). As the name suggests, it loops back on itself. The loop defines the main logic of our circuit.

4.Experimental Setup:

For the Experimental setup we need to choose hotspot place where wildlife is getting injured or death. For second application we can use it in almost every station or in the busiest railway stations.

Case 1:

In this case our objective is to protect wildlife and after choosing a particular hotspot, we need to place the components in following manner. Firstly Ultrasonic sensor is placed upon the arch of railway track which is made up of iron. Then surrounding the track we need to place led lights and Buzzer. The whole set up is backed by Arduino Uno Board. Code is already placed in the board. When an ultrasonic sensor detects movement of the train, it sends a signal to the buzzer, which then emits a loud noise that can be heard by animals that are reportedly walking by the rack while led lights flash continually. Especially elephants try to avoid the track in order to reduce the stress sound by buzzer. In this away wildlife is protected.

Case 2:

This case is extensively developed in order to protect the passengers who allegedly board the train. The space between train and platfom end is enough to cause serious injury and death too. In order to avoid this problem a plank is made to automatically open and closed by DC servomotor. As a train arrives at the station, an ultrasonic sensor at the end of the station detects it and signals a DC servomotor to move. Then DC servomotor allows to smoothly open the sun plank and this closes the space. So passengers can easily board the train there is no chance of any injury too. Whenever the train completely left the platfom the sun plank is closed slowly. The mechanism in the form of Arduino Uno is already connected to ultrasonic sensor. This, technique greatly helps to avoid unnecessary accidents and loss of Human life.

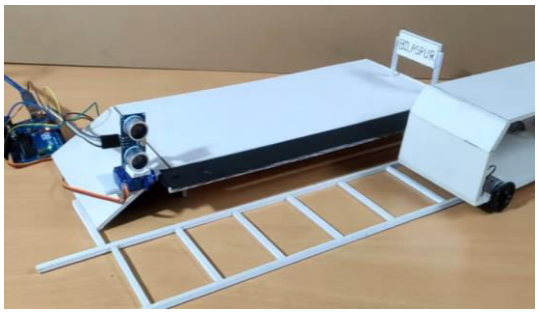


Fig 7: Outcome of application

5.Applications

The system provided protects both human and wild life.

In the first application the combined action of Arduino Uno, Ultrasonic Sensor, Led Light, Buzzer alerts the animals which are trespassing the train tracks.

In the second application the foot space between the train and platform bed is completely closed by sunplank, hence no human will fall between the space existed, therefore human life is proteced.

Second application is wildly used in busiest railway stations.

6.Conclusions and Future Scope

Daily numerous people board trains to reach there destination. On an average 32 people lose there life due to train

accidents in a day. We need to take certain precautions to reduce these accidents. So the proposed applications can reduce the train accidents maximum extent. By adding the camera and wifi module control operators can also monitor the situation in the first application. This feasibility makes the proposed application much efficient.

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