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Crack Detection for Railway Tracks and Accident Prevention

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***Abstract:** In this project, we are developing a system which can detect the cracks in tracks, derailment problems which helps to avoid accidents and collisionsthere by saving thousands of lives.The Speed of the train is reduced .Whenever there is human presence on tracks which can be detected using PIR sensors resulting in the suicides. Here we are going to use fire sensors to detect fire in the train. During the times of this Fire accidents an alarm (buzzer) is sounded which alerts the passengers. This project consists of GPS module, GSM modem, IR transmitter and receiver, PIR sensor,microcontroller, Fire sensor, Ultrasonic sensor. Collision mitigation avoidance system involves automatic braking in which if the sensor detects if there is any collision in the future and alarms the driver to take necessary action.If the driver shows no respond then it takes the complete charge of braking system and applies the brake, avoiding the collision. Required output is obtained by giving inputs to the microcontroller.*
***keywords:** ir transmitter and receiver, pir sensor,gps module,gsm modem,fire sensor,ultrasonic sensor,microcontroller*.

I. INTRODUCTION

Transportation helps in moving people and goods from one place to another. It plays an important role as it helps in the development of trade ,exchange and travel thereby playing a vital role in economic development.

Hence there is a need to ensure safe transportation. In India train is the main basic means of transportation used by the public. The death toll from rail disaster has been increasing since 2010. The main causes include derailments ,collisions and fire in train.so there is aneed to overcome these disasters.Vehicle technology has gone through a great change over years.The technology trending now is the automatic emergency braking system(AEBS). These involves sensors that recognise a future accident and applies emergency brakes thereby avoiding the collisions.Sensors are also used to detect an obstacle ,be it a vehicle or animal or anything stationary.Other safety measures include detection of fire ,crack detection .

All these can be done by providing a sensor for each purpose.Positive train control(ptc) represents a system that monitors the train movements and positioning. It contains GPS navigation.It was implemented to avoid train to train collisions and derailments. Thus implementing PTC, we can reduce rail disasters to a long stretch.

II. DESIGN

The major components used in the block includes IR sensor, Ultrasonic, PIR sensor, flame detector.cracks in the railway track can be detected by IR sensors. Infrared (IR) .These sensors contains a transmitter that can transmit infrared rays and a receiver that can receive back the transmitted rays.

Measure should be taken to make sure that both the transmitter and receiver lies in a straight line. If the signal sent by the transmitter is received by the receiver section it indicates the presence of crack in the track and position say the latitude and longitude of the crack is send to the base station through GSM using GPS. Electronic devices like PIR sensors are used to detect the radiations emitted by objects or living beings.

These find its applications mostly in the motion detectors. We have even got the ultrasonic sensor which gives the distance from the track and fire sensors which alerts whenever there is a fire detected in the vehicle.

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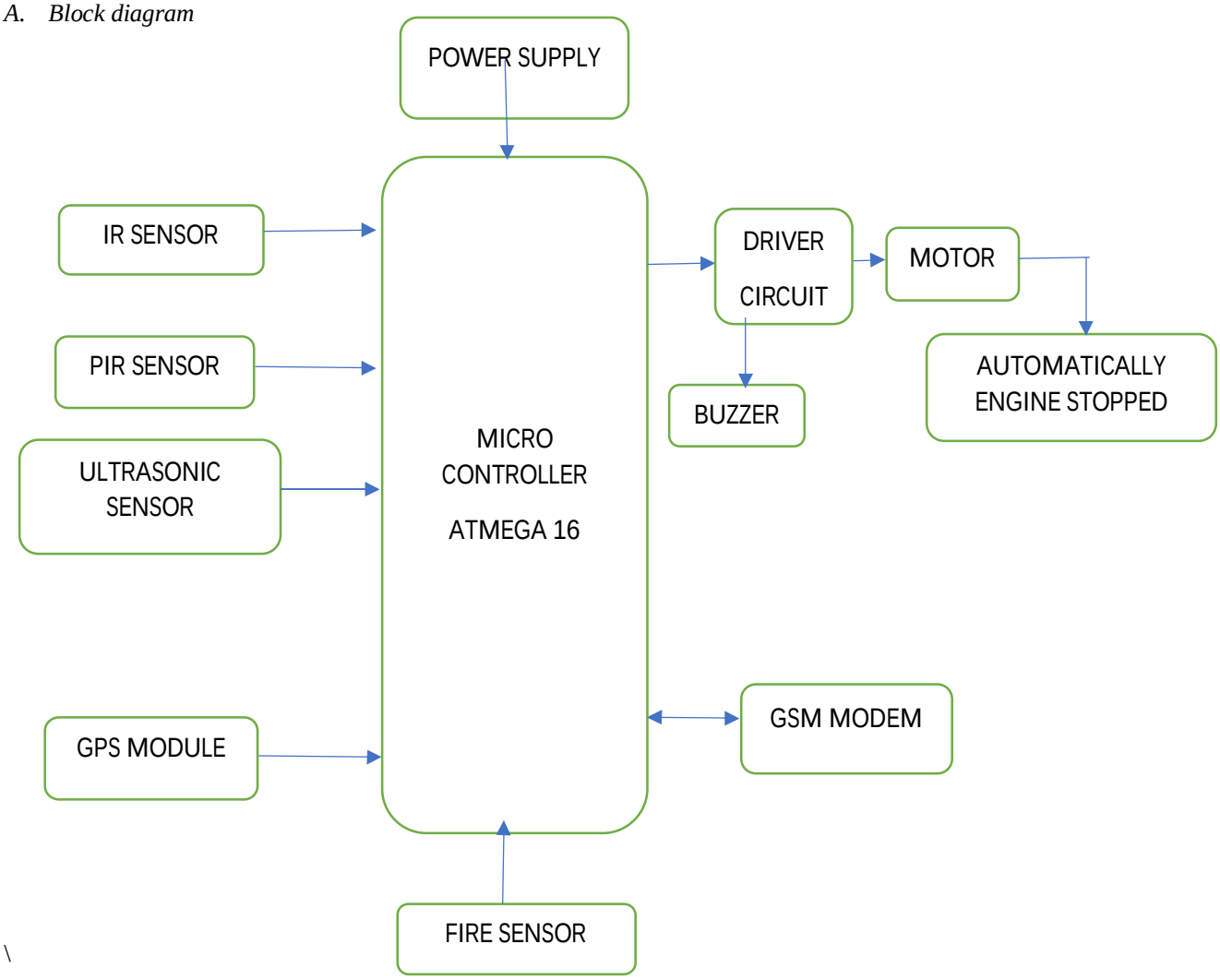
A. Block diagram



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B. Explanation of blocks

1) Microcontroller: Here we have made use of Atmega 16 micro-controller .It is based on RISC architecture and has got 32 I/O pins. It is known for its low power consumption.All the inputs of various systems(sensors) is given as input to the microcontroller and it gives the desired output.It has the capability of executing 131 powerful instructions.

2) Ir Sensors: These sensors consist of IR transmitter and receiver section. The transmitter transmits IR rays and on the other end IR receiver receives the IR rays,Care has to be taken that both the transmitter and receiver section are in the same line of sight.

3) Pir Sensors: Passive infrared sensors has an ability to sense the radiations emitted or reflected by any object or living thing thus making it useful to sense the human presence or any other object. It is named as passive because it doesnot emit or produce any radiations.

4) Ultrasonic Sensor: These are used to measure the distance at which the crack occurs and the required data is transmitted to the nearby stations.

5) Gps Navigation: It gives the latitude and longitude of the object required or say crack here in this project .Thus global positioning system helps in finding the position of the object

6) Gsm Module: This module is used to send the message or data through SMS to the nearby or required stations or destination.

C. Automatic brake system

This system is all about applying brakes whenever there is an emergency to avoid collisions or accidents after giving a warning buzzer to the driver.

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D. Fire sensor

This sensors detects the fire and alarms the driver and the passengers whenever there is an immediate ,unexpected fire. The message is sent to microcontroller which inturn switches the buzzer.

E. Working

Multiple operations are done by the microcontroller here. Starting from sensing to sending the alert messages .For the crack detection IR sensors are used if the IR rays are received by the receiver it depicts that there is crack in the track. Then the GPS detects the location of the crack and by using the GSM modem the message of the positioning and distance of the crack from the train which is done by using ultrasonic sensors are sent to the nearby stations alerting the railway authority.PIR sensors detects human or animal presence in the track and alerts the emergency braking system which stops the collision ,simultaneously message is sent through GSM modem during any malfunctioning or emergency.In case of fire,the sensor inputs the microcontroller which sounds the buzzer alarming the entire crew. Thus each operation is operated depending on the situation.

F. Advantages

Collisions are reduced Derailments are controlled
Death troll decreases..More comfortable and secure transportation
Alerts about the emergency situation like on board fire

F. Applications

Night vision
Data about the train position
Water analysis
Fire detectors
Continuous monitoring of train functions and position
Rail safety

III. RESULT

The proposed system consists of a variety of sensors which detects and sends the information to the microcontroller and the microcontroller gives the desired output by triggering the required system.All these forms up the positive control system of the train .when an object is detected by the passive infrared sensors it warns the driver to apply brakes .sometimes the tracks get worn out or damaged, then the infrared sensors detect the crack and sends the message to the nearby base station.Flame detectors has the tendency to detect the chemicals or radiations emitted during a fire and are used to detect the flame or fires and immediately water is scattered to that area.When the driver drives the train in high speed which can lead to derailments ,the sensors monitors the speed and warns the driver. If the driver does not respond then the train automatically slows down.

IV. CONCLUSION

The successful implementation of positive train control will offer several technical advantages and will help towards country economic development . Improvements in the services can lead to a comfort and safe travel with less environmental impact.This idea can be implemented in large scale to ensure railway safety in the future. care should be taken about the tracks because they tend to wear and tear in due course of time. Railways play a major role in the development of industries and provides a strong medium for national integration hence there is a need to ensure safe transportation which is the aim of this paper.

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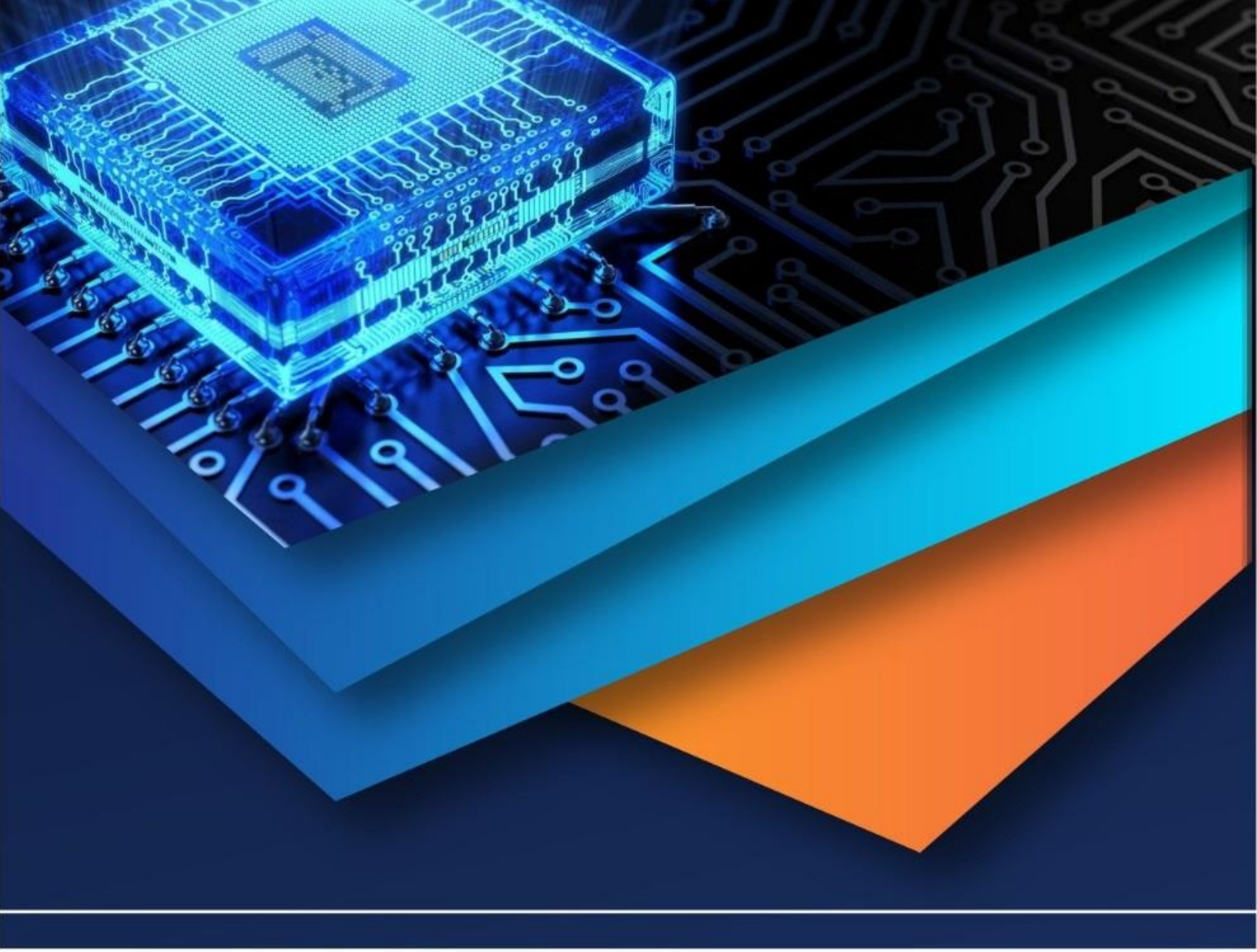

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