Train Collision Avoidance System

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Abstract---The number of collisions occurred in railways. Because collisions were occurred due to track cracking and not identified the trains coming on the same track at the right time. Maximum peoples were losing their lives due to collision. Most of the accidents were occurred with negligence of humans and without proper communication from Train Traffic Control Station (TTCS). To prevent this problem we identified a sensors which will identify the railway track cracks and identify the opposite train in the same track within a short time. The purpose of the project is to develop and design a low-cost system with high integrity and reliability for enhancing to prevent the train’s collision in adverse weather situations, such as a foggy or rainy and identify the track problems. In this we used UV sensors, IR sensors, LPC2148 processor to prevent train collision as well as track cracks. In this paper we alert the station master, driver to avoid the train collisions with the help of GSM

Keywords---Train Traffic Control Station (TTCS), UV Sensors, IR Sensors, GSM, LPC 2148 Processor.

I. INTRODUCTION

The Indian Railways (reporting mark IR) is an Indian state-owned enterprise, owned and operated by the Government of India through the Ministry of Railways. Railways were first introduced to India in the year 1853 from Mumbai to Thane. In 1951 the systems were nationalized as one unit, the Indian Railways, becoming one of the largest networks in the world [1].

It is one of the world’s largest railway networks comprising 115,000 km (71,000 mi) of track over a route of 67,312 km (41,826 mi) and 7,112 stations.[3] In 2015-16, IR carried 8.101 billion passengers annually or more than 22 million passengers a day and 1.107 billion tons of freight in the year[1].

On an average for every minute at least one person dies in train crash. Annually 3 million people were seriously injured by these train accidents. The accidents were happened due to human and equipment failures, leads to safety violations. To provide safety to human lives and to reduce the accidents we developed a new product[1].

The proposed model contains Ultrasonic sensors (UV sensors), Infrared sensors (IR sensors), microcontroller and GSM technology. GSM technology is used for communication purpose. Using this GSM we can provide wireless communication. UV sensors are used to identify the presence of objects. IR sensors are used to identify the track cracks. This model also have one 16*2 LCD (Liquid Crystal Display) display. It displays the information on the screen. All these components are connect to the micro controller[2].

II. TRAIN COLLISIONS

It is very difficult to stop such a collision, because of speed of the train, which need large distance to stop. Collision occurred by two ways due to human error. The two types of Collisions are,

A. Head-on collisions
B. Rear-end collisions

A. Head-on Collisions

Figure 1: Head - on Collisions

A Head-on collision occurs most often on a single line railway. This usually means that at least one of the trains has passed a signal at danger, or that a signalman has made a major error. Head-on collisions may also occur at junctions. Head-on collisions, sideswipes, and run-off-road crashes all belong to a category of crashes called lane-departure or road-departure crashes. This is because they have similar causes, if different consequences. The driver of a vehicle fails to stay centered in their lane, and either leaves the roadway, or crosses the centerline possibly resulting in a head-on or sideswipe collision, or, if the vehicle avoids oncoming traffic, a run-off-road crash on the far side of the road.

B. Rear-end-Collisions

Figure 2: Rear- End-Collisions
A Rear-end collision (often called simply rear-end or in the UK a shunt) is a traffic accident wherein a vehicle (usually an automobile or a truck) crashes into the vehicle in front of it. Common factors that contribute to rear-end collisions include by driver inattention or distraction, tailgating, panic stops, and reduced traction due to weather or worn pavement. It may also be a rail accident wherein a train runs into the rear of a preceding train.

III. SURVEY ON TRAIN COLLISION

The following below table shows the Different Collisions Occurred Between the Trains.

<table>
<thead>
<tr>
<th>Year</th>
<th>Track Problems</th>
<th>Crossing Accidents</th>
<th>Collisions</th>
<th>Other Problems</th>
<th>Total Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-10</td>
<td>12</td>
<td>71</td>
<td>9</td>
<td>6</td>
<td>108</td>
</tr>
<tr>
<td>2011-12</td>
<td>60</td>
<td>54</td>
<td>5</td>
<td>3</td>
<td>142</td>
</tr>
<tr>
<td>2011-13</td>
<td>57</td>
<td>62</td>
<td>6</td>
<td>6</td>
<td>124</td>
</tr>
<tr>
<td>2012-13</td>
<td>49</td>
<td>59</td>
<td>4</td>
<td>8</td>
<td>122</td>
</tr>
<tr>
<td>2013-2014</td>
<td>22</td>
<td>51</td>
<td>3</td>
<td>10</td>
<td>117</td>
</tr>
</tbody>
</table>

IV. GRAPHICAL REPRESENTATION

If there is any obstacle in the track, the sensor module automatically identifies and sends the information to the microcontroller and information will display on the screen. The same information will send to the Train Traffic Control Station (TTCS).

2. **IR Sensors**

IR sensors are used to detect the track cracks. Each IR sensor has one transmitter and receiver.

3. **GSM**

GSM (Global System for Mobile communications) is a wireless network. GSM have different frequency ranges.

V. TRAIN COLLISION AVOIDANCE SYSTEM

In proposed system we will provide security and collision avoidance with sensors and GSM technology.
We are using 950-1050 HZ range. The GSM module creates connection between the train and the Train Traffic Control Station (TTCS). The micro controller is connected with the GSM, so the information from the train is transferred to the station. The GSM module has an inbuilt chip for programming. The GSM Module accepts SIM card to send and receive messages. It has copper wire antenna to receive the signals.

4. Micro Controller

A microcontroller (or MCU, short for microcontroller unit) is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM.

Figure 8: Microcontroller

Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose application. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems consisting of various discrete chips. It consists of

1. LPC2148 Processor
2. LCD Display

1. LPC2148 Processor

It is a general purpose 32-bit microcontroller. It is very small in size. LPC is Low power and Low cost microcontroller. It contains two ports. Each port contains 32 I/O pins. Each pin has their own specific functionality. The pins that are not connecting to a specific functionality are controlled by general purpose I/O registers.

2. LCD Display

It is very important in embedded system designs. We can show information easily by using this. It requires low power.

VI. OPERATION RESULTS

In this paper we are using LPC2148 is main controller. The GSM is connected to this processor. We have to register in this paper by sending our number. Two IR sensors are connecting to processor to check tracks and UV sensors also connect to this to check objects in the track. If any sensor get activated SMS will send to the registered number and display on the LCD display. The train will stop automatically. Here the DC motor acts as a train.

Figure 9: SMS

The screen shot of sms is shown below. We have to register by sending our number. Ex: * phone number Then we will get message to your registered mobile number.

Figure 10: Mobile Number

Figure 11: Message Recieved

If there is any problem in the track or any object appears on the track we will get message to your registered mobile and displays on the screen.
Train accidents can happen very often due to safety violations which results from human error or limitations in the operations of the existing system and also due to equipment failures. As by the project is fully concentrating on avoiding train collisions and ensures passenger safety through android system integrated with ultrasonic and IR sensors based control system inbuilt in the train.

VIII. CONCLUSION

In the above section I represented number of accidents occurred in previous years. To avoid the train accidents we implemented a new product with UV sensors, IR sensors. The product was tested and working properly. The main intension of the project is to prevent train collisions. By using this project many human lives can be saved. This project can work in any atmospheric conditions. Without any human involvement the trains will automatically stops, if any sensors get activated.

REFERENCES


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