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Automatic Fire Rescue System in Railways By using myRIO- LabVIEW

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Abstract: Even if an accident occurs due to human error or an unexpected circumstance occurs in the fast-paced automation environment, more technologies are created. So, in order to minimize the number of casualties in the event of a train crash, we developed an improved fire rescue system. Smart sensors and myRIO technology were used to build and implement this device. It will automatically detect a fire and transmit the information to the loco pilot through wireless signal transmission. As a first move, the fire will be extinguished, and information about the accident will be transmitted via Short Message Service (SMS) to crossing and approaching stations, as well as to passengers via an alarm system. This SMS reliably conveys the status of a fire accident by transmitting physical parameters such as compartment number and fire strength. This also shows the same area code for that GSM Mobile network. The complete location where the train is stopped, as well as train information, could be obtained from the control room. As a whole, this mechanism means that the number of people killed in incidents is reduced.

Keywords: Flame Sensor, Fire alarm system, Servo motor, automatic sprinklers, GSM, Zigbee, myRIO, LabVIEW.

I.INTRODUCTION

Railways are one of the world's best modes of transportation because they are more convenient and comfortable for travelers. In India, about 20 million people travel by train each year. The development of railways in our country has been rapid; however, there are numerous unanswered issues in the way of steady growth, such as train fires, train collisions, and so on. The only precautionary alerts about the fire in each compartment are the notes that state "Do not smoke" and "Do not bring inflammable content." Fire accidents in trains, on the other hand, are common due to failures in the routine maintenance system or the actions of illegal social elements. As a result of these concerns, the human mortality rate has risen. Everyone is responsible for fire protection. Any employee should be aware of how to avoid and respond to a fire.

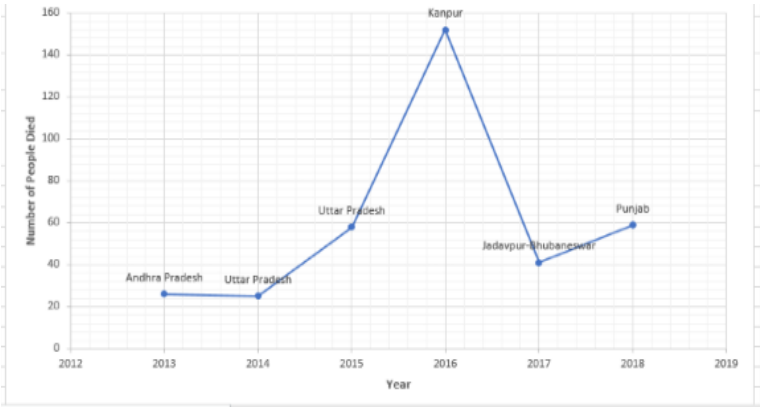

Figure 1. Major fire accident in train

Our project's main goal is to use automatic water sprinklers, CO2 fire extinguishers, and compartment separation to prevent fire from spreading. As a result, we will be able to lower the risk of human mortality while still ensuring the safety of travelers on their journey.

II.METHODOLOGY

In this project, if a fire breaks out for some cause, the flame sensor installed in each compartment will detect it. To detect a fire, fire detectors are mounted in each compartment of the train. For each compartment, three sensors will be used. The fire sensors are discussed, and using myRIO, LabVIEW acquired data signals from the sensor. Through the display, the loco pilot can see the status of each compartment. Water sprinklers are installed in two compartments, and

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a CO2 Class B fire extinguisher is installed in the engine compartment. The servomotor is used to divide the compartments, and the servomotor and water sprinkler are then interfaced. So that the water sprinkler and servomotor spray water on the compartments together. The use of Zigbee-based wireless sensor technology in conjunction with GSM allows for smooth serial communication between the device and the loco pilot. If a fire begins in the first level, the sensor detects it with a flame sensor and sounds a warning. As a consequence, the passenger, TTE, and loco pilot can be informed. The water sprays and CO2 are released in the second level, and the compartments are separated using a servomotor. The message will be sent to the crossed and upcoming stations at the end of the process. The message contains information about the current state of the fire, the measures taken, the number of compartments that need to be divided, and the location of the fire. The whole procedure was completed at the same time.

Figure 2. Transmitter Block

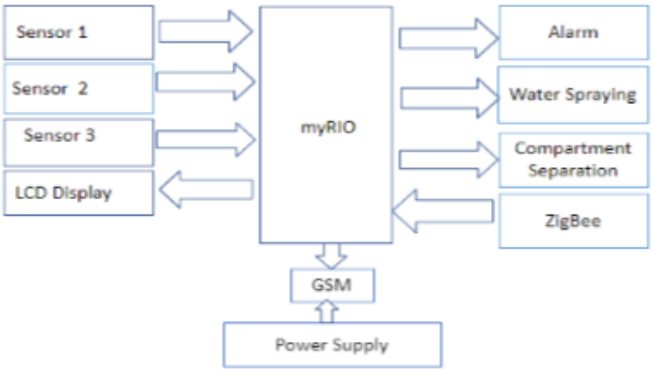

Figure 3. Receiver Block

III.SENSOR IDENTIFICATON

Flame Sensor

A flame detector is a sensor that detects the presence of a flame or fire, making it possible to detect flames. When the flame sensor detects a change in temperature, the output is sent to myRIO. Their function in applications such as industrial furnaces is to confirm that the furnace is operating properly; it can be used to switch off the ignition system, but most of the time it does nothing more than alert the operator or control system. Because of the mechanisms it uses to detect the flame, a flame detector may also respond faster and more accurately than a smoke or heat detector.

Figure 4. Flame Sensor

IV.EXPRIMENTAL WORK

The flame sensor, which is mounted in each compartment of the train to detect fire, can detect it. Through the display, the loco pilot can see the status of each compartment. Here we are displaying automatic fire alarm and water spraying system which is interface with myRIO by using LabVIEW.

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Figure 5. Train Engine Compartment

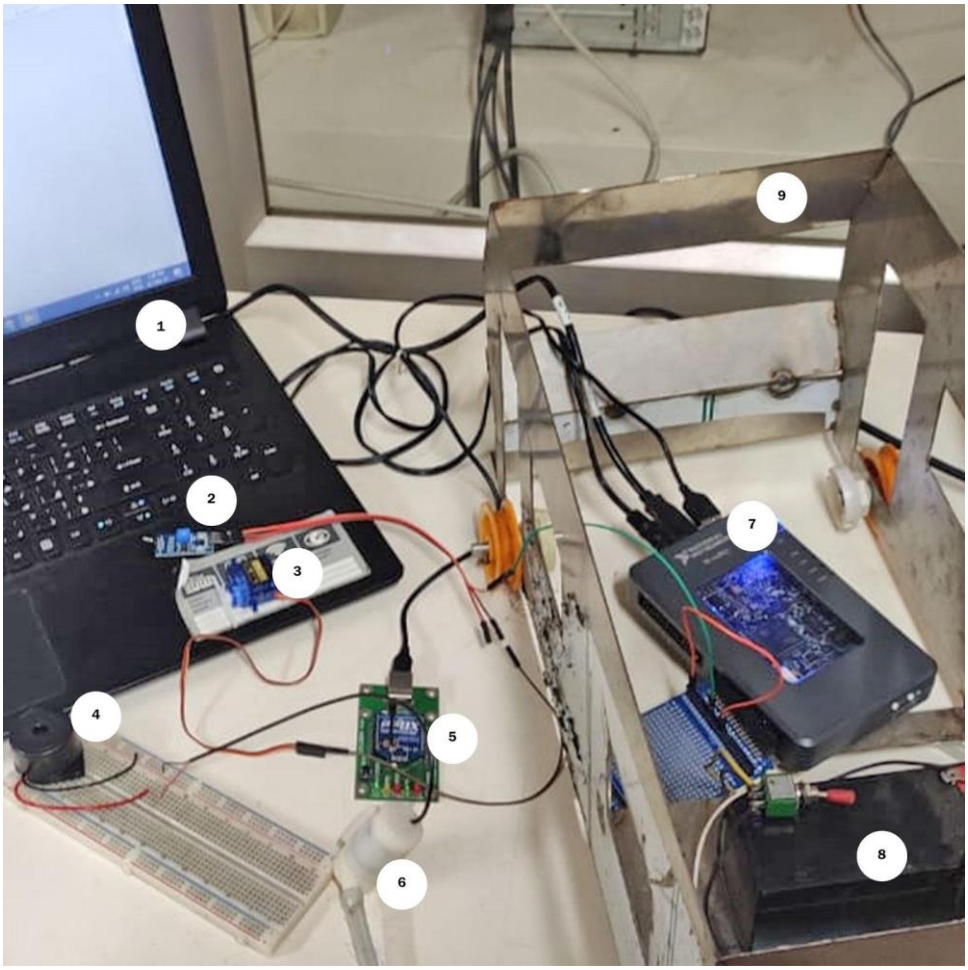

Figure 6. Hardware Implementation

From figure 6,

1. Programming and Monitoring
2. Flame Sensor
3. Servomotor
4. Alarm
6. Water Pumping motor
7. myRIO
8. Battery
9. Train Compartment

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5. Zigbee

The acronym RIO stands for Reconfigurable Input/Output. myRIO has a programmable dual-core ARM cortex A9 processor. A Xilinx Field Programmable Gate Array is included (FPGA). myRIO's necessary terminal is a power supply, which we connect to our device using a USB cable. The data from these sensors is read using the LabVIEW Software and myRIO

V. RESULT AND DISCUSSION

There are several ways to put out a fire, but using myRIO-based tools, we get a very fast response and result in LabVIEW.

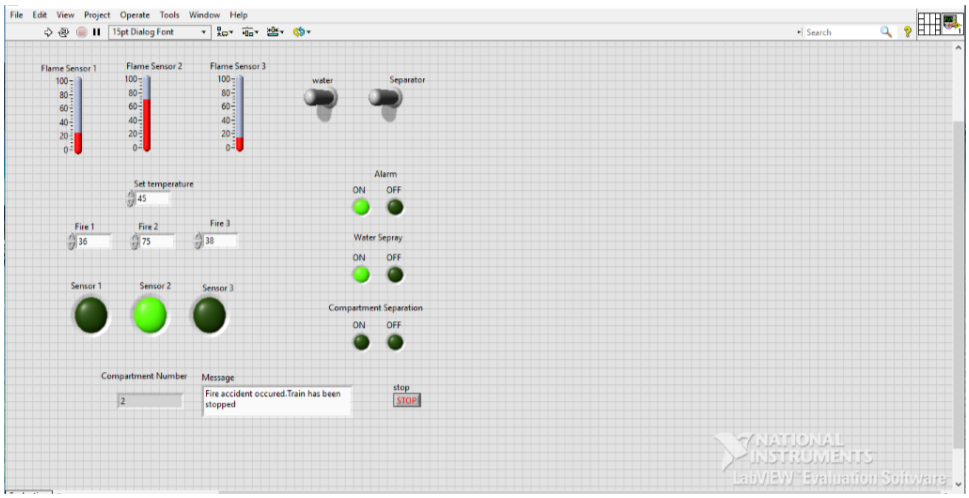

Figure 7. LabVIEW Front Panel

We can presume from this front panel that a fire has been identified in compartment 2. As a result, flame sensor 2 is turned on. The warning alert and water spray are both turned on at the same time.

VI.CONCLUSION

MyRIO is used to implement this working framework. This device would be extremely useful in minimizing fires by detecting fire at an early stage, alerting passengers, relaying the warning to the loco pilot, and taking urgent action to prevent the fire from spreading. As a consequence, the device is extremely stable. Fire is both a good servant and a poor slave, so we must treat it with caution and caution. By using this technique, we can achieve better results in future.

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