

# Anti-Derailment and Health Facility System

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**Abstract**— ADHF system is advancement in the existing system of the Indian Railways. Railways is facing a no. of derailments cases which causes loss of property along with the loss of lives of people which cannot be refurbished by money. This project focuses not only on the certain factors causing the rail accidents but also focuses on the health of the travelling passengers as well. The very interesting part of this project is that all the modules can be implemented on large scale means they are directly applicable on the live trains and tracks.

**Keywords:** Anti-Derailment, Health Facility System

## I. INTRODUCTION

The Indian Railways is one of the largest networks of Asia with very convenient means of transport. It is easy to travel via trains because they are economical and eco-friendly as compared to the other means of transportation systems. But the present technology is not so advanced that it can take care of its properties and the lives of the travelling passengers and the workers that is the major reason behind the rail accidents occurring so often. Nowadays may train accidents news come very frequently. 2018-19 still won't be a good year for the Indian Railways. Train accidents and derailments in 2018-19 are-3 February 2019 - Seemanchal Express accident: 11 coaches derailed near SahadaiBuzurg railway station, about 50 km from Patna. 20 April 2019 - Derailment of 12303 Howrah-New Delhi Poorva Express at the outskirts of Kanpur Central near Rooma happened around 12:45 am. No fatality was reported, and 15 people were injured and were sent to nearby hospital in Kanpur. A total of 12 coaches were derailed but the explanation for accident was unknown. 29 August 2019 - 12723 Hyderabad Deccan-New Delhi Telangana Express Pantry Car Caught fire near Asaoti leading to burning of two coaches 11 November 2019 - 16 passengers were injured, and motorman killed when Lingampalli bound MMTS rammed into incoming Hundry Express at Kacheguda station. Hundry express had been given signal to enter the station when the outbound MMTS rammed into the train at the points. 6 May 2018 - The WAP 4 loco of train 12810 Howrah-Mumbai Mail caught fire and resulted in death of assistant loco pilot and injury to loco pilot between Talni and Dhamangaon on Wardha - Badnera section. The enquiry stated that the hearth was thanks to a defect within the loco. 24 July 2018 - 5 killed, 4 injured in accident at St Thomas Mount station on Chennai Beach - Tambaram section. The victims were passengers on a Chennai Beach-Tirumalpur local (No 40701) who were hanging out from the doors once they were struck by a wall. This was unexpected because the train normally stopped at another platform but was diverted to the present platform. 4 died on the spot. 10 October 2018 - New Farakka Express accident: 7 Killed as Engine, 9 Coaches Derail in UP's Raebareli 19 October 2018 - Amritsar train disaster: About 59 people were killed and

about 100 injured when a train saw a crowd of spectators who were standing on the tracks watching the Dussehra festival in Amritsar. In the 2019-20 Budget, funds of Rs 7,255 crore are allocated for construction of latest lines, Rs 2,200 crore for gauge conversion, Rs 700 crore for doubling, Rs 6,114.82 crore for rolling stock and Rs 1,750 crore for signaling and telecom. The allocations have remained an equivalent as within the interim budget presented in February. Track failures and consequent derailments are caused by two factors – excessive traffic and under-investment in rail infrastructure. According to a report by India Spend, as much as 40 per cent of Indian Railways' 1,219-line sections are utilized beyond capacity

## II. LITERATURE REVIEW

Many researchers work for the development of the Indian Railway and some of the researcher are given as follow: - In [1] Authors declared crack detection sensor is used that will be placed in the train engine. By this, Train will be slow then stops when it detected that the track is cracked and sends signal to control room. Secondly subsequent explanation for accidents is prevented from two trains opposite in same track by using an equivalent sensor fitted within the engine, if the sensor senses the same signal from opposite train then it automatically applies the brake and stops the train at certain distance. The derailment causes several loses in railway accidents. The proposed system introduces Bluetooth based technology, to prevent the train's accident. The Bluetooth device is installed at each front of the locomotive. If the train starts to derail, automatically signal is broken and an alert is given to engine driver and on the other emergency brake is applied automatically. The main aim of the work is to avoid the train accidents without manual power.

In [2] authors explain that novel technology to recognize the situation in distant place is necessary to develop a railway safety monitoring system by which human being having fallen onto the tracks from a platform and obstacles within the grade crossing are often detected. In this research, the authors propose a method for detecting a stationary or moving obstacle by the technology which employs the super resolution radar techniques, the image Recognition techniques, and the technology to fuse these techniques. This method is designed for detecting obstacles such as cars, bicycles, and Human on the track in the range up to hundreds of meters ahead by using sensors mounted on a train. In super resolution radar techniques, novel stepped multiple frequency radar is confirmed to supply the expected high-resolution performance by experimental study using software defined radar.

In [3] paper, a new type of autonomous train is developed. The localization system is made with GPS and GSM device. Currently, three tasks, including collision detection and following, object detection, and obstacle

avoidance, has been implemented on this platform. Developing on-board automotive driver assistance systems getting to alert drivers about driving environments, and possible collision with other train has attracted tons of attention lately. In these systems, robust and reliable train detection is a critical step. This paper presents a review of recent vision-based on-track train detection systems. Their focus is on systems where the sensor is mounted on the train rather than being fixed such as in traffic/driveway monitoring systems.

This paper [4] is implementation of an efficient RF based Train Anti-Collision for railways is being proposed by the author. A safe distance of 1 Km has been maintained between two trains after applying the hand brake just in case of collision detection. Based on the studies, it is observed that even for 2 trains traveling at 140kmph, the safe distance after automatic braking under normal conditions is approximately 920m. All sub modules are designed and simulated using Proteus electronic simulation package and therefore the prototype is implemented. It is expected that if this technique is implemented widely, train collisions and accidents are often avoided. The up-gradation is additionally done by following the thought of checking cascaded connection of the compartments in sequence manner.

In paper [5] the authors declared that Nowadays we face many train accidents due to track faults, obstacles etc. To overcome these problems, we use sensors and RF for detection and control through long distance wireless communication. The Ultrasonic, PIR sensor and serial data transmitter detect the issues within the train track and provide a message to the microcontroller. RF receives that message and turns ON the safety alarm to warn the passengers and the driver. The MOSFET controls the speed of the train and stops before 20 km of the obstacle or the fault within the train tracks.

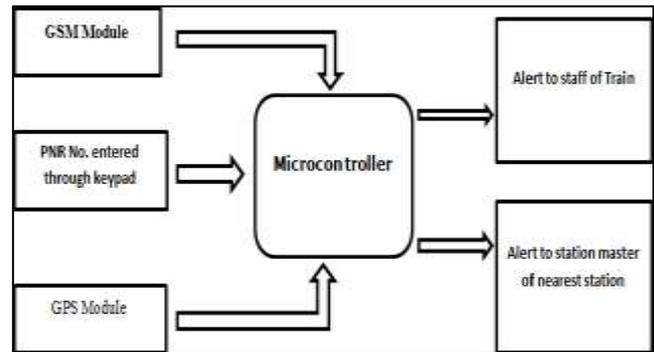
In this paper [6] author declare the recent developments in Railways in developed countries, limitations and problems that are associated with Railways. Also, an impact of Indian Railways at the worldwide level are going to be presented. Solutions and visions that are proposed by Indian Government to satisfy and to match the technological development with the developed countries are also will be discussed during this paper.

### III. PROBLEM IDENTIFICATION AND ITS SOLUTION

The main objectives of the proposed project are:

- Fog avoidance system.
- Emergency health facility system.
- Detection of construction on the track.
- Detection of obstacle on the track.
- Smoke/Fire alarm.

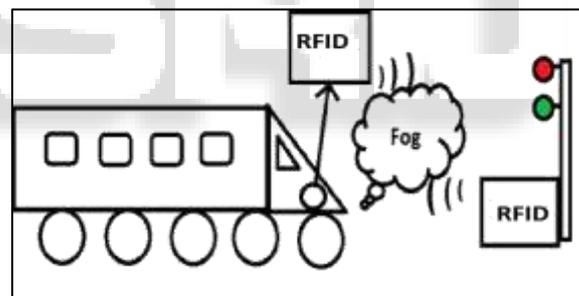
This project is very helpful to reduce the factors of the derailment of the trains. This project covers almost all the factors of the train derailment and help to reduce the train accidents. All the modules and the concepts of all modules are new and advance technologies are used in all modules. This project is needed in Indian railway system because in railways still all the old techniques and technologies are used.



In future it is expected that the cases of derailments will be minimized to a great level if work on this project is done properly and will improve the condition of the present system and its technologies of the railway. It will not only provide better conditions for the system but will also provide many facilities for the travelling passengers which will ultimately encourage more people to travel via trains as there will be medical facilities as well for them. The present conditions will be improved and many things will be monitored by the train itself which are responsible for the derailments and causing the loss of property of government and the loss of lives of passengers and workers. Hence, it will save people's lives and further money will not be spent which has to be in cases of the derailments and thus accidents will we reduce in large scale.

### IV. DESIGN AND IMPLEMENTATION OF PROPOSED SYSTEM

#### A. Fog avoidance system



In this module firstly the RF will receive the status of signal from signaling poll then this received value will compared with the data stored in database. As shown in fig. if the status of signal is red then corresponding Red LED will glow in the engine of Train indicating train is not allowed to move further so the driver of train will stop the train by applying brakes. On the other side, if the status of received signal is green then Green LED will glow in the engine indicating the track is clear and train can move further. So, in this the driver of train will move the train forward.

#### B. Emergency health facility

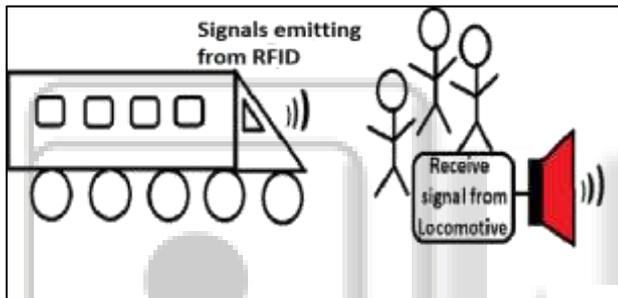
In our module a button will be pressed by the person medical emergency followed by entering of PNR number. This will send a text message to station master or other higher authorities of upcoming Railway Station. The text message will consist of the details like seat number, coach number, name and other details of the passenger availing medical facilities and when message is received by the station master of upcoming station, he will have the enough time to arrange Doctor and other required medical

equipment to attend to passenger. Additionally, a text message will also be delivered to the running staff of train including the Driver also. This is necessary in order to stop the Train at the nearest station.

When the passenger feels that he or she is healthy then he will enter his PNR number in the module installed in the coach. A cross check will automatically made by the system into the database that whether the PNR number is correct or not. If it is found to be correct then further processing will be done else LCD will show wrong PNR entered and system will become idle.

### C. Detection of construction on track

In this module we have provided a option by which workers have an option that they can tell the Driver of Train that we are performing some construction work on track and we have insufficient time to cross the track so you need to control the train by applying brakes. After receiving this driver of train will start to apply brakes and thus the lives of workers will be saved. In this module the train will continuously emit its track-id. Whenever the workers will come to work on track, they will be wearing their smart watch.

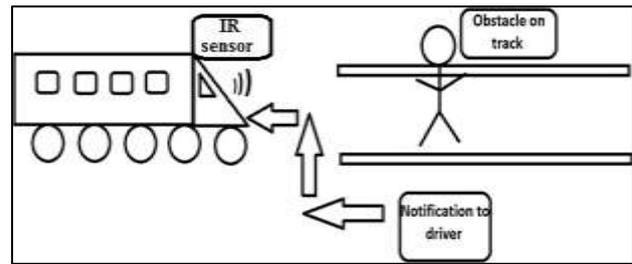


This will help them to avoid accidents. When the train will come in the vicinity of workers the smart watch with workers will start to receive the signal emitted by the train. This will glow the LED in the smart watch and will also start the buzzer present in smart watch. Thus, the workers will move to safer places and will resume their work when train will depart from their site. Now if the workers have some heavy machinery and they think that do not have adequate time to move on safer places they can also Convey the same to the driver by just pressing the switch present in their smart watch. Upon receiving this signal from the workers, the train driver will immediately stop the train by applying brakes.

### D. Detection of obstacle on track

The general working diagram of obstacle detection module has been shown in fig. We have mounted an IR and Ultrasonic sensor on the train. The IR waves are transmitted out by the IR LED of sensor and in normal working of IR sensor these waves are reflected back to receive on the IR Photodiode which is also a part of IR sensor. When the track is clear i.e. there is no obstacle in the path of track all the transmitted intensity of IR waves will be equal to the received intensity of IR waves. This is when the normal operation of sensor occurs. When any hindrance comes in the path of Train it will absorb IR waves coming from the IR LED and thus will not completely able to reflect all the transmitted intensity of waves. Some of the intensity will be

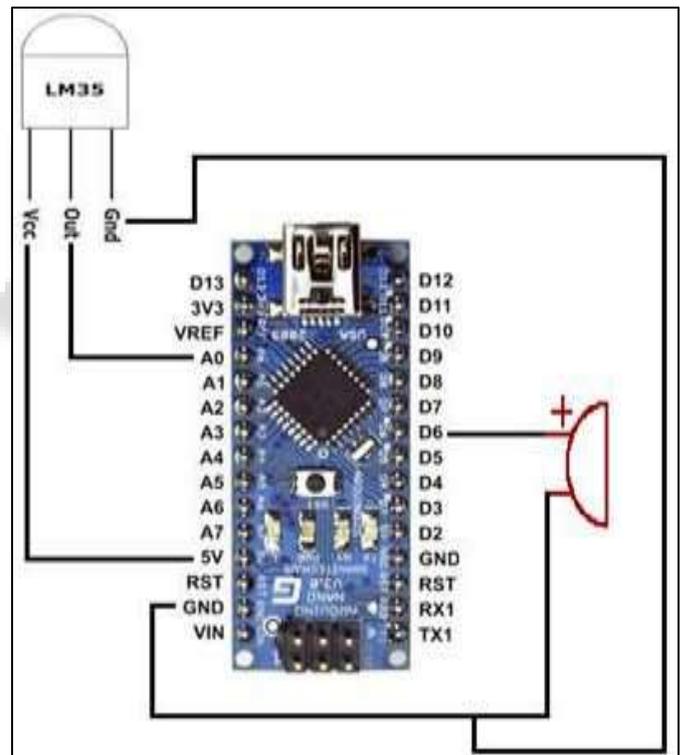
lost. This indicates the presence of an obstacle in the path of train.



When any obstacle is detected in the path of train it will immediately be reported to the driver of train. The driver will immediately start to apply brakes and thus the accident will be avoided to save the lives of obstacles.

### E. Fire alarm

The input of temperature sensors will be fed to microcontroller. We only need to set the threshold value for each sensor and in case of any value exceeding the threshold value fire will be detected which can be informed to driver to stop the train. We have set a threshold of 40°C, if the temperature exceeds it will inform the driver to apply the brakes.



## V. CONCLUSION

It is expected that proposed system will overcome the number of rail accidents day by day. The main cause of train accident is derailment of the trains. Our project tries to overcome almost all the causes of derailment. It will provide a safety feature for the passengers travelling in trains.

It will also provide medical facilities for the passengers. There is Emergency health facility system that will provide better options of safety of passengers as this device will be available directly to the passengers. It will be a new concept in the existing system of Indian Railways as

till date no such devices are available in trains. It will allow the passengers to avail the medical facilities in case of emergency and will improve the quality of life.

Late arrival of trains will be minimized by using the fog avoidance system. Many trains are late in winters due to fog so we provide this module as the solution to this problem of the train by using RF. RF is able to send signal in the fog also so it alerts the driver about the status of the pole of the track and thus in turn minimizes the train accident due to misunderstanding of the driver about the signal.

Many times, a train driver has no information about the construction going on the track on which the train is travelling, which leads to accidents. Thus workers and passengers' lives are in danger. So, this module of our project gives indication to construction side workers that a train is coming on the track as well as to the train driver that construction is going on the track. If workers are not able to clear the track on time, they will press a button on the smart watch that notifies the driver that the track is not clear so that the driver will apply the brakes and the train will stop.

Sometimes it happens that suddenly animals or any other obstacles come between the tracks, which results in the death of animals and humans also. To avoid this system, we use an IR sensor which detects the obstacles on the track and accidents will be avoided.

Smoke/fire alarm will notify about the danger of fire and will provide an additional safety feature. It will encourage more people to travel via trains as facilities are increased.

All the modules of our project can be easily implemented in real time and all modules are derived by the new advanced and secure technologies like RF. This project is used to improve the quality of life and reduce the loss of life and property by reducing the number of accidents of trains due to derailment.

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