TRAIN COLLUSION AVOIDANCE SYSTEM WITH BRAKING UNITS

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Abstract - *Train Collusion Avoidance System (TCAS) is a Microcontroller based safety signaling device which will automatically apply penalty breaks in case the driver is incapacitated. Similar operations are available in older locomotives in the form of TPWS (Train Protection and Warning System). This concept has been employed with computer data. Where sensitive information has been previously encrypted and released to the public. Train Collision Avoidance System is a Safety Critical system. The System Architecture should be such that it gives approved method of working, ensuring high degree of Safety, Reliability, Availability and Maintainability.*

Key Words: **TCAS, Microcontroller based, Collusion Avoidance, automatically apply penalty breaks.**

1.INTRODUCTION

The Railway is leading preliminaries on a native and financially savvy hostile to impact innovation, which can help deflect mishaps that happen because of the driver's mistake. Indian Railway right now utilizes Automatic Train Protection System called Train Protection Warning System (TPWS), which depends on European innovation. As of now it is accessible in only 100 trains due to the significant expense factor. The natively evolved innovation will cost 33% of the European framework and can be introduced on a lot bigger number of trains. The new framework is called Train Collision Avoidance System (TCAS). TCAS will have two fundamental capacities. Assuming a motor surpasses its speed on a specific area, there will be alerts created for the driver. In the event that the driver neglects to react, the brakes will apply naturally. Furthermore, a train can send a SOS message to another or to a railroad station and the other way around to forestall a mishap.

2. RELATED WORKS

[1] Collision hazard examination based train impact early admonition technique, Li Si-hui, Cai Bai-gen, Liu Jiang, Wang Jian, 2014. A Train Collision Early Warning System (TCEWS) has been created for impact aversion. Be that as it may, there are not many examinations with respect to how to assess the impact chance and give an early admonition concerning a first train on the rail route. In this paper, we possess tracked down that the energy for impact evasion is compelled by the circumstance of occasions, like remote correspondence inertness, driver response, wellbeing security distance and deceleration rate. Thinking about these planning parts, an opportunity to stay away from a crash is determined precisely.

To assess the potential impact seriousness when the accompanying train draws near, the crash hazard is characterized dependent on an opportunity to keep away from an impact. The train crash early admonition signal is partitioned into a four-level shading coded framework dependent on the impact hazard, with red addressing the most extreme crash hazard, trailed by orange, yellow and blue. A field trial of the train crash early admonition system on the Hankou–Yichang Railway is examined. It is exhibited that the procedure has adequate capacity to show an expected impact and caution the accompanying train.

[2] Study on Train Collision Avoidance System for Securing Safe Distance between Trains, Kangmi Lee, Eunkyung Chae, Sechan Oh, Jonggue Hwang, 2013. This paper is concerning the utilization of train crash evasion framework to get the security of two trains situated at the nearby distance, for example, the case for change in train development, alleviation destroying drive, and activity with variable arrangement. In the activity technique for fixed square framework, nearness driving of train in the ordinary activity circumstance is unthinkable as per the guideline of driving 1 train in 1 square segment.

Given, in any case, in the extraordinary operational circumstance like the adjustment of train development, help destroying drive, variable arrangement recorded in the past provision, the nearness driving of train is essential, and an uncommon driving mode which can be driven under the duty of motor driver is existed for this reason. Be that as it may, exceptional driving mode can be a weight to the train activity since the motor driver is completely liable for the security of train, and the activity mode like this prompts the mishap brought about by the human blunder. This paper investigated issues of current activity strategy for safe activity of two trains in the nearby distance, and attract the technique to tackle them.

3. EXISTING SYSTEM

The Indian Railway Network in the fourth biggest rail line network on the planet involving 119,630 km. Hypothetically TCAS can be carried out on the whole length. While TPWS can be powerful on the programmed flagging course, TCAS can be introduced on block flagging course contingent on its effective preliminary. Moving stock has ~11,100 motors/trains while TPWS (the costlier form of TCAS) is carried out in just 100 trains. Manual Hand Brake Pilot utilizes manual hand brake to stop the train. So therefore, the train is halted with the assistance of switch and moving the speed increase switch decreased from Release, Run to Initial.

4. PROPOSED METHOD

The Proposed system Architecture consists of Black box concept build upon a common core (European kernel) handling the safe speed control – functions stimulation through standardized balise/infill and radio interfaces.

5. METHODOLOGY

The Data of the track are feed on to the Line Side Electronic Unit (LEU) place on the track side which containing the former information of the track and sensitive data. Now the Eurobalise receives/transfers the data from the balise and antenna using the Radio transmission/GPS over airgap transmission. Then from the received data the LEU analysis the status of the train and it updates to the onboard components using the same transmission model.

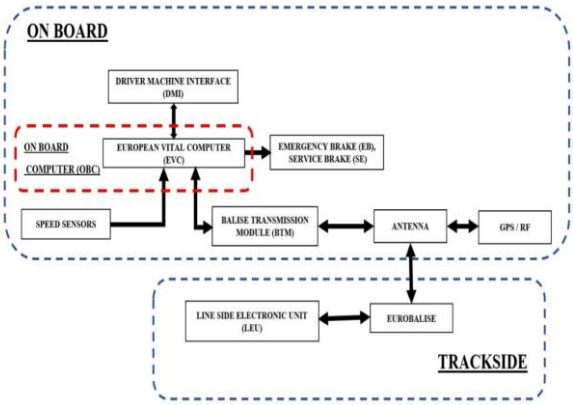

FIG -1: Block Diagram

On the onboard components the data is received by the antenna and forwarded to the BTM module then BTM module transmits the data to the European Vital Computer (EVC), on other hand the EVC receives the input data from the speed sensors at a regular time intervals and analysis the data if there is any issues in the input data then EVC interfaces with the pilot using the Driver Machine Interface (DMI) for the input data and displaying the status of the train and track, if the pilot doesn't responds to the machine using DMI and if the train fails to follow the signals and speed limits set for each place at the track then the TCAS warns the pilot , if he didn't respond to the system and didn't reduce the speed of the train and didn't follow the signal , then the TCAS checks if train runs at a speed of 15kmph then TCAS will apply Service brake and the train is slopped slowly or else if the train is running over the speed of 15kmph then Emergency brake is applied and the train is stopped suddenly.

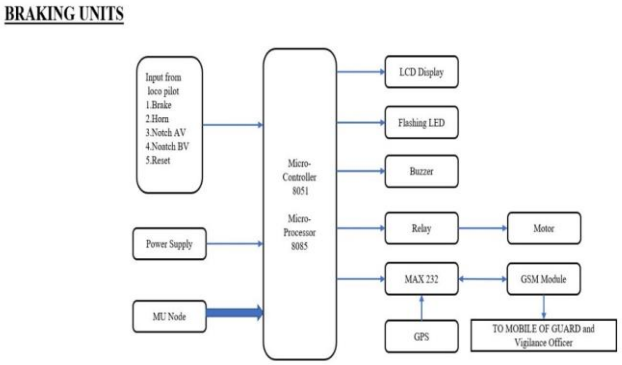

FIG -2: Block Diagram

The Braking units is also called as Vigilance Control Device (VCD). The main functioning of the VCD is to check whether the pilot is alert and runs the train at consciousness only, if the pilot is not alert / slept / death then the VCD applies the penalty brakes and then stops the train and sends the longitude and latitude of the train to the nearby station guard. The pilot should be giving any of the repeated input such as Brake, Horn, Notch AV, Notch BV, Reset. Within a time interval of less than 60 seconds, the timer of 60 seconds will be running if the pilot gives the input then it timer will be rested back to 60 seconds as a loop, incase if he fails to give any input within a time period of 60 seconds, then an alarm and an light flashing will be done for a timer of 8 seconds , and an alert message is sent to another pilot residing nearby the pilot, if the both pilot's didn't respond the 8 seconds timer then the an alert message is sent to the Guard in the train "that pilot and co-pilot is not alert", and automatic Emergency brakes will be applied and the Latitude and Longitude of the train will be sent to the nearby Railways station and the higher officials that the train have been stopped at this place and check the issue.

6. EXPERIMENTAL RESULTS

If pilot acknowledges with the speed limit of the respective tract and follows the signal, then the TCAS will just govern the pilot and the braking units and train will be under the control of pilot.

FIG -3: The System Indicates that there is Red Signal on the Track

FIG -4: TCAS Applying the Emergency Brakes

FIG -5: Train Stopped before the Red Signal

If pilot doesn't acknowledge the speed limit of the respective tract and fails to follow the signals, then the TCAS will automatically apply penalty brakes either Service brake or Emergency brake based on the speed of the train.

FIG -6: Alert Message in the LCD Display with Flash Light and Alarm

FIG -7: The Latitude and Longitude of the Train where it has been Stopped

If pilot acknowledges the 60sec issue then the pilot is awake and the train will run in its own running speed.

If pilot doesn't acknowledge the 60sec issue then the pilot is not awake and the train will stop and sending GPS point to signal inspector.

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