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Railway Anti-Collision System using DSLR Sensor

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Abstract

Railway collision is a major problem so this work is concentrated to avoid major and small causes of train collision on same track. Proteus software helps to route mapping and direction for the railway. The primary goal of our anti-collision system is to identify such collision points and to report these error cases to main control room and substation .using this electronic software and ultrasonic /DSLR (Digital Single-Lens Leflex) sensor defense a fog problem because of ultrasonic distance sensors range. To build this system, advanced sensing technology, long distance communication system (RS 485protocol), microcontroller (AVR AT8Mega) and wireless Communication protocol has been used.

Keyword: Proteus, DSLR (digital single-lens reflex), Zigbig, ACD, GPS Locator etc.

Introduction

Indian Railways is an Indian state owned enterprise, owned and operated by the government of India. It is one of the world's largest railway networks comprising 115,000 km (71,000 mi) of track over a route of 65,000 km (40,000 mi) and 7,500 stations. Railways were first introduced to India in 1853 from Bombay to Thane. In 1951 the systems were nationalized as one unit, the Indian Railways, becoming one of the largest networks in the world. IR operates both long distance and suburban rail systems on a multi-gauge network of broad, meter and narrow gauges. Railways are recognized as the safest mode of mass transportation and Safety has been recognized as the key issue for the railways and one of its special attributes. All business strategies emanate from this theme and strive to achieve Accident Free System.

The Ministry of Railways (Railway Board), Govt. of India has referred Ten Train Collisions in the past for development of an efficient Train Anti-Collision system [1] and the need for research in this field. Kankan railways have proposed and implemented an Anti – Collision System [2]. The system did not take any active inputs from existing Railway signaling system, and also lacked two ways communication capability between the trains and the control centers or stations, hence was later decommissioned. The system consists of Loco ACD with a console(message display) for the driver (in each Loco E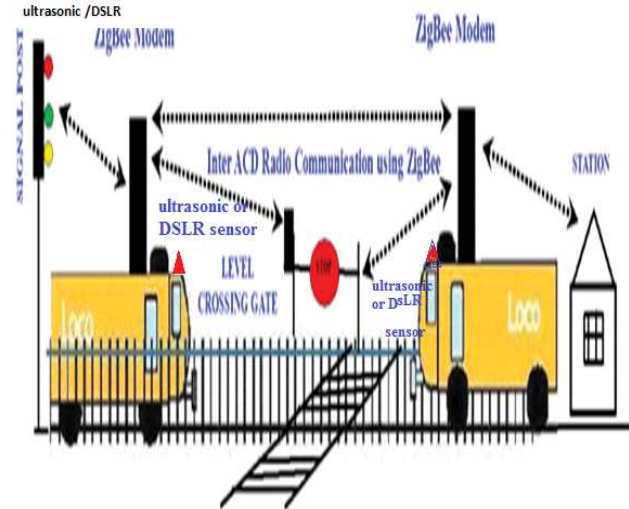ngine), Guard ACD with remote (fitted in Guard Van), Station ACD with console (fitted in Station Masters' Cabin), Manned and unmanned Gates ACD with hooters and flashers (in each location) and Repeater ACDs (fitted at locations having obstructions in radio communication such as hilly areas) which work in concert to prevent the following kinds of collisions and accidents like-Head on collisions ,Rear end collisions ,Collisions due to derailment, Collisions at the level crossing gates . The proposed Train Anti Collision and Level Crossing Protection System consists of a self-acting microcontroller[4] and two way ZigBee [5] based data communication system which works round-the-clock to avert train collisions and accidents at the level crosses. Thus enhances safety in train operations by providing a NON-SIGNAL additional safety overlay over the existing signaling system. The idea of WiMAX [3] is to provide high speed connections to users in rural areas as; it provides an alternative to wired connections (DSL or Cable) which are expensive.

rear end collision

head on collision

Materials and Methods

The basic strategy in this work is focused on "Preventing The Collision". Head–on collision is the collision of two train from the front ends of the train when hitting each other towards their head opposing to side-collision and rear end collision. Rear end collision is the collision of trains hitting rear part of one train from the head on collision by the other train. Generally collisions in railway system mainly occur due to trains which are human operated i.e. Controlling mechanism is operated manually due to which possibility of error and accident occurrence by small mistakes is more which causes major distortion and hazardous accidents. So to be more conscious and effective to avoid the collisions AUTOMATIC CONTROL MECHANISM should be taken in process in railway system to control the trains automatically by using the necessary equipments. So in taking reference to it this project is based on designing anti collision device in which designing of automated system is inside the train itself which is mainly self operated. Automated System works or activates when the two trains are running on the same track, the distance sensor detects and measures the distance between them and according to it monitor system acts gradually to slow down the speeds of train and at that instant if the distance sensor sense any obstacle in front, it measures the distance from it and the monitor system again performs the same action by slowing down its speed if object found in particular range of it.

ACD (ANTICOLLISION DEVICE) consists of a microcontroller, LCD panel and Wireless Communication Unit, Potentiometer, button switches, transistor, LED etc. If the two trains are on same track, heading towards each other and if it comes in the range of transreceiver then the red LED will glow and a warning message is displayed on the LCD panel and both the trains will automatically stop. If the two trains are on same track moving in the same direction then ACD will check for speed and if the speed of rear end train is more then the rear end train will automatically stop without affecting the front end train. The rear end train will not move until any of the train changes the track. As ACD will detect the collision, the red LED will glow and a warning message is displayed on the LCD panel. The green LED indicates the smooth movement of trains.
GPS LOCATOR is use in the project for detecting and determining the location of trains which is directly connected to satellite. GPS Locator determines the presence of trains running on the same

track and distance between the two trains respectively. GPS activates after detecting two trains running on same track and will give the distance and locations of it to the main monitory unit and to the head station. After receiving the information, the main unit will determine trains speed and distance between them if both trains are present on the same track. The main unit performs action by reducing speeds of both the trains it will check if the train is very near at that instant train will switch to apply braking system and sends the information to the nearby railway station and train stop, at the same instant if another train arrives on the that track the main unit sends the information of this train and it will stop just before the station.

control unit
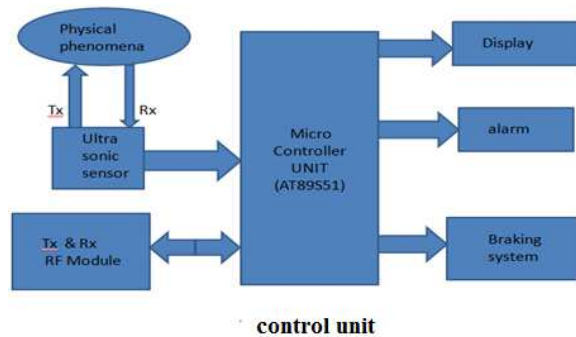
Physical phenomenon starts in device with ultrasonic sensor and DSLR sensor which senses the obstacle in the range of transmitter module of less than 100 centimeter in front of the train and captures its exact image on the screen. Due to ultrasonic sensor and Tx and Rx RF module the distance measurement from the obstacle will display in LCD and the next step of reducing speed in the monitor unit will perform with the help of AVR programming in ATmega8 IC in which the action of slowing down speed perform and it allows the instruction of applying braking system within a range to stop train takes place respectively. It generally produces alert warning sound
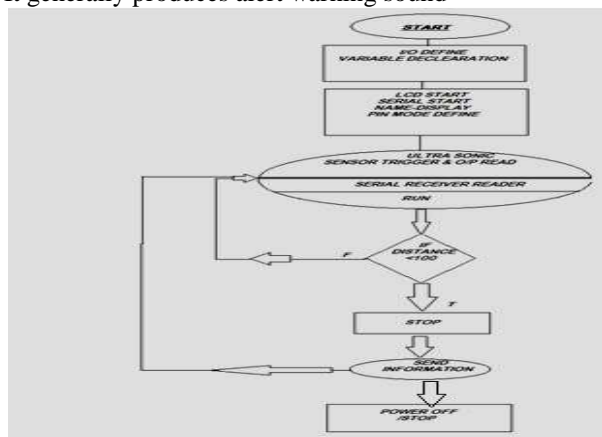
With the help of alarm in the main monitory unit where it indicates the presence of obstacle in the front

of the train and the next step will be perform by main unit.

Result

This work helps efficient train anti-collision, gate protection system and any other object that come on the track. This work implement new APS-C-sized DSLR that features the newly designed Dual Pixel CMOS AF technology, a refined 20.2MP APS-C image sensor, and a 3.0" vary-angle touch screen LCD monitor along with a host of photographic and video-centric assets that combine to form a truly powerful image-making device that can handle video and still photo tasks with ease. Combination of software and hardware give a perfect anti-collision system.

Conclusion

While rail continues to be one of the safest modes of transportation, the overall safety has not significantly improved since the Railway Safety .Continuous improvement is important to achieving a better safety record. Certain accident categories have seen little improvement in accident rates over time, while others are worsening and have the potential to negatively affect public confidence in the railway system. Nonetheless, we also observed stronger safety records in certain areas and believe they are the result of sustained efforts to improve safety. Through this innovative technique of early sensing of any possible collision scenario and avoiding it thereof, we demonstrate that it is possible to improve the overall safety of the railway system in India. We believe that success depends on both the railway industry and the regulator working together to achieve that common goal.

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