SMART RAILWAY AUTOMATION SYSTEM USING IOT- A LITERATURE SURVEY

Abstract

Even with greatest of ideas to avoid railway accidents, many trains accidents still happen worldwide. This paper shares an idea on how to avoid train collision by using an automated control incorporated in the trains. In this proposed paper we have implemented ideas such as pre-crashing using RFID sensor, ultrasonic sensor in-order to choose an array of commands which would run as per the conditional algorithm created in the microcontroller.We would also have a EPM to control the speed of the motor to lessen speed. This system will be more efficient since it was fully automated and also it was cost effective.

Introduction

We wanted to be apart of our surrounding with some change and advancement so that it can bring the better life of the middle class and lower class people to travel in high secutity and advanced locomotions .the train is one and only most widely used transportion,and not only for this they are used for goods transportion also .Indian railways are not able to facilate the customer properly due to crowded amount of people. Statistics show that the leading cause of death by injury in railways traffic accidents(two train collision each other). There are number of causes for which an accident can occur, some of them are; lack of training for driving or less experinessed, use of mobile phone while driving, unskilled drivers, driving while intoxicated, bad railway tack condition, overloading in tain and negligence traffic management. In this survey paper, we briefly review selected railway accidents detection techniques and propose a solution. Rear end crashes occur mainly due to obstracle and crack in tracks.According to recent statistics, a major percentage of train accident happen due to not proper survillance of railway track.

In feb a train was travelling in the forest range of bihar state were five elephant were hit by the train which was moving ata high speed.Collisions of train happened in last year june were the indian railway minister felt guilty. a moderate rate of 2% fatalities compared to all other types of crashes, it represents the highest rate of injuries that is 22% and also the highest percentage of loss of life, being 28%. There have been enormous efforts to develop an algorithm in the field of automation of smart railways Systems (ASRS).An intelligentin railways transportation system (IRTS) is an advanced application, which aims to provide services and protect the life of people inside and also outside the railway.

The existing system in semi automated railwaysaccidents are occuring at frequently, consideration this inmind we want to bring some change and make it effective so that it becomes a complsory and law for pratice.

Once the implimention of smart train with lot of new techonology many ideas have been proposed for essential advancement in developing system meant for better travelling livihood. A system based on vision and video processing has been proposed that could employ a camera to take video images and extract features for finding the obstacleand behaviour of obstacle around and draw conclusion to avoid acidents. Live camera that analize the images from the video to recognise obstacleand sends an alert if it detect a automated engine breaking using EPM module

The main objective of this study is to provide frameworks on the development of smart train automation method that can avoide collision risk vehicles, detect their relative distance and speed and therefore inform the driver about a probable accident. The systemwe proposed will prevent collision of any form of accident in the railways system.

Existing Works

[1] Most of the public transportation infrastructure in European cities is easily accessible. The majority of the tram/train stations are located in an open and "gate-free" environment, easy available to everyone and hence introduces potential malfunctions in the system. This is why fare dodging (hopping on the tram/train without paying for a ticket) is simple. This paper suggests a conceptual framework andarchitecture to capture free riders (fare dodgers) in an early stage by using a RFID distance scan combined with people counting techniques as a tool to locate and monitor passengers. As a case study this paper uses the ticketing system in The Netherlands. It is a RFID-based ticketing system which uses a smartcard called OV-Chip card. It explains the current setup in The Netherlands, systems and architectures used and showswhere possible problems and improvements could be achieved. An experiment is done to measure certain basic distance read ranges in different situations and locations. The results show that by making use of a different system architecture (RFID technology and People Counting Techniques) an improvement in catching free rides (fare-dodgers) in a much earlier stage is inspectors

[2] Wheel set is one of the vital components of the train. Normally, the wheels are regularly detected by using ultrasonic technology to check cracks, especially in wheel rim. In order to eliminate the failure risks of wheels, daily dynamic wheel set inspecting system is needed during the light maintenance period. A way-side arrayed ultrasonic technology is described in this paper to detect wheel cracks. By using a specially designed track structure ,the arrayed ultrasonic probes are arranged between the double-track for wheel rim inspection .From the testing results, Φ3mm side drill hole in the wheel rim can be well detected at the running speed of 30～40km/h. The noise is effectively suppressed by filtering algorithm, thus to improve the signal to noise ratio and the positive alarming rates. At present, the technology has been successfully used in Chinese high-speed train maintenance centers, rolling stocks and locomotive maintenance depots.

In this paper [3], numerical investigations are carried out to assess the possible use of vibration measurements to identify the presence of a fatigue crack in railway axles. A non-linear finite element model of a cracked axle, reproducing the crack breathing mechanism, is introduced. The solid model of the axle is built in the ABAQUS FEM software and a crack is introduced in it. Numerical simulations are presented for two different types of axle: hollow ones, as in passenger trains, and solid ones, as in freight trains. Simulation are carried out for different possible locations of the crack and different measuring points for the monitoring equipment. Results indicate that the presence of a crack in the shaft affects not only the vertical vibration signal, but also the horizontal (perpendicular to the axle axis) one, generating harmonic components of bending vibration at frequencies that are multiple integers of the frequency of revolution of the axle. Results revealed also that the horizontal vibration provides promising indicators of axle fault development because the effect of various sources of disturbance, namely wheel out-of roundness, can be more easily dealt with.

[4], In India, most of the commercial transport is beingCarried out by the railway network and therefore, any problems in the same has the capacity to induce major damage to the economy-notwithstanding the societal impact of loss of life or limb. This paper proposes a cost effective yet robust solution to the problem of railway crack detection utilizing a method that is unique in the sense that while it is simple, the idea is completely Novel and hitherto untested. The paper discusses the technical and design aspects in detail and also provides the proposed robust crack detection algorithm. The paper also presents the details of the implementation results of the RRCDS utilizing simple components inclusive of a GPS module, GSM Modem and LED-LDR based crack detector assembly. The proposed scheme has been modeled for robust implementation in the Indian scenario.

[5],The Indian Railways has one of the largest Railway networks in the world, crises- crossing over 1,15,000 km in distance, all over India. However, with regard to reliability and passenger safety Indian Railways is not up to global standards. Among other factors, cracks developed on the rails due to absence of timely detection and the associated maintenance pose serious questions on the security of operation of rail transport. A recent study revealed that over 25% of the track length is in need of replacement due to the development of cracks on it. Manual detection of tracks is cumbersome and not fully effective owing to much time consumption and requirement of skilled technicians. This project work is aimed towards addressing the issue by developing an automatic railway track crack detection system integrating an infrared red (IR) crack sensing module and a communication module based on GSM technology by which information about the location of the crack can be conveyed to a central location enabling the immediate attention and intervention of maintenance personals.

In this paper [6], we introduced the integration of railway track surveying system. In our proposed system it is used to detect the railway crack. This project consists of IR sensor& fire sensor. The IR sensor is used to detect the crack and as well as distances, fire sensors used to detect the fire accidents. To communicate the received information, we make use of a GSM modem. The GSM module is being used to send the current latitude and longitude data to the relevant authority as an SMS.The importance of this project is applicable both day & nighttime detection process applicable both day & night timedetection process.

[7],The IR transmitter and receiver total station for railway track geometry surveying system. Railway Crack Inspection is dedicated as a measure of railway safety. The defect information can be wirelessly transferred to railway safety management centre using a GSM module and it includes defect level and location information which is acquired by embedded GPS receiver. In terms of the reliability and safety parameters, Indian railway has not yet reached the international standards. The main problem about railway analysis detection of cracks in the structure. This work proposes a cost effective solution to the problem of railway track crack detection utilizing IR transmitter and receiver which tracks the location of faulty track which then mended immediately so that many lives will be saved. If these deficiencies are not controlled at early stages they might lead to a number of derailments resulting in a heavy loss of life and property has train derailment can be avoided and chance of loss of human life and economy can be minimized.

[8],In the fast developing country, people are facing many accidents; it would be undesirable for any nation to losing their life for unwanted cause. Railways are one of the important transports in India. There is a need for manual checking to detect the crack on railway track and always railway personnel takes care of this issue, even though the inspection is made regularly. Sometimes the crack may unnoticed . Because of this the train accident or derailment may occur. In order to avoid this situation and automate the railway crack detection has been proposed. Here ultrasonic sensor is used to detect the crack in the railway track by measuring distance from track to sensor, if the distance is greater than the assigned value the microcontroller identifies there is a crack, also it tells the exact location of the crack by the formula "DISTANCE=SPEED*TIME". While the checking process is going on, the train may approach, it is identified by the vibration sensor and gives alert to the microcontroller, thereby shrinks the size of the robot between the two tracks. After the train has crossed it returns to its normal position and continue its checking process.

[9],An Unmanned Aerial Vehicle (UAV) has several applications in the modern scenario. It can be used for capturing live video footages for sports like cricket or football or even commercial applications. It can even be used for procuring images at places where human intervention is difficult and so, can find wide application in disaster management. This paper mainly deals with the localization of a UAV and how it can be applied for detecting cracks in a railway track using the concepts of image processing. The algorithm used for localizing the UAV is called Monte Carlo or Particle filter localization algorithm. The video taken from the UAV is

processed by further extracting image frames and analyzing each of these image frames for detection of cracks along railway line. A real-time implementation of our proposed method can significantly reduce physical labor involved in crack detection and also reduces the risk of accidents.

[10], This paper suggests the use of distance readability as atool for distance reading and scanning of RFID based chipcards. The distance reading can be effectively used, tocapture potential free riders,.who are in the possession of achip card. While distance scanning alone will not be able todetermine the actual number of free riders, an additionaltechnology to count the number of people in an area isproposed . The clue of combining the two technologies (RFID distance scanning and People thermal image counting) is the basis on which this paper suggests away to capture free riders in an early stage. This paper willfocus on a framework and architecture needed to capture faredodgers (free rides), the expected results of the empiricalstudy and research thereof will be used to perform tests in anexperiment to verify the assumed expectations.

Video analysis for rail inspection at a large scale has become a possibility [11]Safety in railways is one of the key issues for public transportation companies and a fast and efficient inspection system is important to ensure the safety of railways. Traditional rail inspection methods include *destructivetechniques*, such as coring, and *non-destructive techniques*,such as hammer sounding. But these methods can just "cover limited area and have limited effectiveness in identifying possible sites of deterioration" (Delatte et al., 2003). Further non-destructive evaluation techniques for rail inspection have been recently developed. These include visual inspection, ground penetrating radar (GPR), infrared, X-ray, laser light, diagnostic train, magnetic methods, impact-echo, spectral analysis of surface waves (SASW) and impulse-response.

Studies on the collection of videos for railway inspection through manual observation have been carried only recently by some academic/industry partnerships in Canada, USA, Netherlands and Japan.a video logging project in most countries recently where the recorded video is viewed by a human expert manually to make decisions.Here objective is to automatically find clips in video sequences and thereafter recognise whether they are broken and if they are new or old as indicated by their colour. Metal clips hold the rail track to the sleepers on the ground. We need to find the clips and locate their position.All the boundaries between two dissimilar regions in an image are represented as a one-pixel width line after Canny edge detection. As we are only concerned with track and clips, so we do not need to analysis all the edges. As a result, some edges that is shorter than a threshold in the edge detected image should be considered as unimportant features and be removed.

Help of wifi in the railway system[12]"Probe" means an exploratory device for investigating and obtaining information on a remote or unknown region. In the field of road traffic, research is proceeding to acquire detailed traffic flow information and reflect it in traffic control by using probe cars that are regarded as "probes" with an information-obtaining function and having them transmit real time traffic information such as traffic jams and travel times. Probes for such purposes are not necessary in railways that are operated according to time table Maintenance and control of railway tracks, vehicles, and signalling systems are essential for ensuring railway safety [2]. Therefore, data acquired manually at certain locations or acquired by special inspection cars have been utilized for maintenance and control Conditions of tracks and vehicles have been monitored by several methods such as measurements using strain gauges attached to wheels and taken off using a slip-ring or those using strain gauge and displacement sensors on the wayside rail. The carried out simulation studies using multi-body dynamics code, SIMPACK, to find the possibility of detecting track irregularities from car body vibration. Figure 2 shows the SIMPACK model used for simulation study. measures should be taken to ensure accurate measurement of high-frequency vibration components using an accelerometer, e. g., it should be attached tightly to the cabin floor. We therefore invented a method to detect corrugation using cabin noise that is uniquely generated when trains run on rails with corrugation.We developed a portable onboard sensing system for existing vehicles to enable simple diagnosis of