SMART RAILWAY AUTOMATION SYSTEM USING IOT- A LITERATURE SURVEY

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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 acccident 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

tracks using a commercial line. Figure 7 depicts components of the sensing system we developed.The importance of human factors involving train drivers has been emphasized since the terrible accident on the JR Fukuchiyama lineto traffic control station.

Gps and gprs used railway crossing[13] the situation of current domestic and international railway crossing, crossing alarm technology is a major difficulty. It has become a more complicated issue since the sixth railway speed-raising on April 18, 2007. A variety of alarm systems have been proposed previously, but all of them have some problems. Firstly, they have poor system stability and performance; secondly, the active sensors have some
defects like this: instability and short reliable life cycle which would be replaced every two years, complex working principle, cost-ineffective, prone to failure, not convenient for the work, and the most serious problem is that the car will bring vibration and displacement of loose, which will cause the alarm to fail. These problems often bring some illusion and trouble to the guarder, so it is one of the major security risks on railway.the advantages of the two and overcome the disadvantages of them, which made the performance improved significantly. We use the satellite communication to locate the train positions and measure their speeds. The wireless data communication link will provide the information of the train location and speed for the train control center , and in turn control the train speed and signal display.The system is divided into two major subsystems, one is on-board equipment, and the other is control center. The system is mainly used to detect the train travel information, and to notify the control center to alarm with sound and light.GPRS receiver module in control center subsystem receives the real-time train speed and position information. Through filtering the received data, AT89C51 then briefly calculates arrival time of the latest trains, and alarm by sound and light at the right time.Confirmed by the experiment, the alarm system based on GPS and GPRS can not only improve the reliability of communication, but also realize the simultaneous positioning using GPS and GPRS networks in the caves, high-rise areas, and mountains without distance restriction

Evaluation of RCF cracks in rails using an ACFM
Sensor [14] rolling contact fatigue (RCF) cracks have been identified as a major cause of rail track failure [1]. These suface breaking defects are the consequence of cyclic loading of rail tracks at the wheel-rail interface. With the increasing demand for higher axle loads and faster trains, the need for routine inspection of these types of defects becomes much more important. Ultrasonic sensors (UT), eddy current (EC) and magnetic particle inspection (MPI) are the conventional non-destructive evaluation (NDE) techniques which are currently being used in the rail industry. A comprehensive review of these techniques is given in [2].Recently, the alternating current field measurement (ACFM) technique has received considerable amount of attention from the rail industry due to its capabilities, such as: detection and sizing (characterisation) of the surface breaking defects in metals with no need for electrical contact, the ability to perform without surface preconditioning, and importantly the high speed inspection capability. To accurately characterise the detected defects the ACFM probe lift-off should remain constant and also that the ACFM probe should be normal to the surface of the specimen under inspection . The fact that RCF cracks often appear on the gauge comer of the rail, where the curvature changes significantly, makes it essential to measure the rail head profile to take into account the lift-off variation caused by any geometry change. Local measurement of the profile is required, rather than using a standard 'new' rail profile, as the repeated wheel-rail contact results in wear and changes to
the rail profile.

Adaptive noise for railway crack detection using EMD [15] rail crack is one of the most important reasons for track degradation and it can lead to serious traffic accident. In order to detect cracks in rail, various methods are employed. Recently, Acoustic Emission (AE) technology is utilized to investigate the rail crack detection method .Growing crack can generate AE signals which carry the crack information. With the initial crack development and growth, AE technology can passively receive signals from crack. It is an effective nondestructive detecting method for real-time and dynamic detection [3]. With the increase of traffic speed and density on modern

railways, the detection method at low speed will occupy the railway and affect the operation of trains.The filtering method which is based on the fixed frequency bands is difficult to determine the bands of noise signals in various speed conditions. By selecting appropriate wavelet basis, the wavelet method has a good performance in signal detection. However, the selection of wavelet basis has an important influence on the results ..A rail crack detection method based on the adaptive noise cancellation method of EMD is proposed for the high speed application. The rest of this paper is organized as follows. Section II presents the rail crack detection method based on the adaptive noise cancellation method of EMD. Section III introduces test rig and test procedure. In Section IV, the proposed method is investigated by the signals at different speeds and the noise influence is also analyzed. Section V gives the concluding remarks.The acquired signal is decomposed into a number of IMFs by the EMD method, and the correlation analysis is used to determine which IMF contains the useful information. Then, the IMFs which contain the useful information are reserved, and the IMFs which primarily contain the noise signals are removed. At last, the denoising signal is reconstructed based on the useful IMFs and it is utilized to detect the crack signal by wavelet transform. In practice, the detection based on the entire length of signal will lead to great amount of calculation and poor real-time performance. Therefore, the acquired signal is divided in to a number of small segments, then the segments of signal are processed one by one in real-time.The rail crack detection method based on the adaptive noise cancellation method of EMD. Section III introduces test rig and test procedure. In Section IV, the proposed method is investigated by the signals at different speeds and the noise influence is also analyzed. Section V gives the concluding remarks.to achieve the aim of adaptive noise cancellation. The acquired signal is decomposed into a number of IMFs by the EMD method, and the correlation analysis is used to determine which IMF contains the useful information. Then, the IMFs which contain the useful information are reserved, and the IMFs which primarily contain the noise signals are removed. At last, the denoising signal is reconstructed based on the useful IMFs and it is utilized to detect the crack signal by wavelet transform. In practice, the detection based on the entire length of signal will lead to great amount of calculation and poor real-time performance.

Level crossing controller and rail track using IR sensor and internet of things[16] the most commonly usedtransportation mode in India. It is also one of those modes of transport that faces a lot of challenges due to human errors such as level cross accidents, collisions due to broken track etc. A level cross, an intersection of a road and a railway line, requires human coordination, the lack of which leads to accidents, also the main problem about railway analysis is detection of the crack in the location .If this problem are not controlled at early stages they might lead to a number of derailment resulting in heavy loss of life and property. In traditional system level crossings are managed by the gatekeeper and the gatekeeper is instructed by the means of telephone at most of the level cross from the control room. But the rate of manual error that could occur at these level crosses are high because they are unsafe to perform without actual knowledge about the train time table. Delay in the opening and closing of the gate could lead to railway accidents. In order to avoid the human errors that could occur during the operation of gates and derailment due to crack , the proposed paper introduces the concept of railway gate automation and crack detection system has been modified by using IR sensors and IOT (Internet of Things) technology which performs automatic gate operation and helps in detecting of the faulty track In this proposed system we used LPC2148 Microcontroller. It is a 64 pin High Performance ARM microcontroller. It is also tiny size and low power consumption microcontroller. Due to their tiny size and low power consumption, LPC2148 are ideal for application where miniaturization is a key requirement ,such as access control system. It has
serial communication interfaces ranging from a USB 2.0 Full Speed device , multiple UARTS,SPI,SSP to I2Cs.It has on-chip SRAM of 8 kb up to 40kb. This makes devices very well suited for communication gateway .In this paper we have proposed.In the Crack detection system, Before the start of the rail-way line scan the robot has been programmed to self calibrate the IR transmitter and receiver. After calibration, the robot wait for the predetermined period of time

so that the GPS module start reading the correct geographic coordinate. The principle involved in this crack detection is that light reaching the IR receiver is proportional to the intensity of the crack. Both IR transmitter and receiver will be placed straight line to each other on rail. During operation ,when the light from the transmitter does not fall on receiver so that it gives result NO Crack found. And when light from the transmitter fall on receiver i.e light deviates from the path due to crack in the railway track then it gives result as a crack found. In order to detect current location of the train in case of detection of crack ,we have used GPS receiver whose function is to receive the current latitude andlongitude data.

Railway signaling system and theory for development of novel [17] the high maintenance and repair cost, low operation efficiency and unsatisfactory safety are seriously hindering the development of railway systems. The development of autonomous perception and radio-based railway signalling systems are becoming a new objective for all railway engineers. Considerable attention must be paid to the software systems which are safety-critical and belong to Software Safety Integrity Level 4 (SSIL4). Traditionally, the software safety was guaranteed by repeated testing. However, the test approach is inadequate for railway systems, which have a high number of possible evolution paths and failure modes [1]. Moreover,the redevelopment cost is much more than the development cost even errors can be found. Under these circumstances, regarding the systems with high safety requirements such as Level-Crossing Control (LCC), Digital Automatic Train Control (Digital-ATC) and Interlocking Signaling Control (ISC),formal methods(FMs) which can improve the system safety and reliability by eliminating the ambiguities and validating the specification are highly recommended by international standards. Things are more complicated than they were expected to be, various difficulties [2] have to be overcome, which obstructed the application of FMs. Until now, almost all of previous applications of FMs only focused on some critical subsystems, such as communication subsystems or onboard subsystems. Almost all of the existing studies on formal method are subject to an ideal formal model, which is considered completely correct. However, in a practical application the system properties must be stated precisely and formally by natural language firstly (e.g. Chinese, Japanese or English) before formal analysis. In that case, how to guarantee the formal specification is fully consistent with parameters can only be determined after a rigorous calculation according to comprehensive factors e.g. the speed and distances between terminals. By using the state transition diagrams ,they can be conveniently determined. Take the distance between a point and entry point as an example. It is obvious that a long distance will reduce the line efficiency, and a short distance will lead to potential safety hazard. In any case, it must be ensured that after a train sends the entry request to the control center, the train must stop m meters in front of the point, if it doesn't receive a reply in a certain time or receive an emergency brake message. In order to satisfy the safety requirement, the following are assumed: the speed limit .

Automatic train controller system [18] train control systems will have significant dependence on the validity of the movement authorities issued by the control centre. In the European Train Control System (ETCS), a Radio Block Centre (RBC) is responsible for issuing movement authorities to all trains under its supervision, in a way that guarantees the safe movement of all these trains. In ERTMS/ETCS Level-1 the RBC obtains train position information from train detection equipment, whereas in Level- 2 and Level-3 the train position is communicated by the train using its on-board radio. With increasing complexity of train movements across locations demanding widely varying speed profiles at various points of time, obtaining a formal proof that the strategy for issuing movement authorities is safe and consistent with various spatial and temporal constraints is a formidable but necessary challenge. At the heart of this framework is a verification engine that proves that the movement authorities issued by the RBC guarantee that the movements of the trains satisfy all constraints given an inertial model of the train.The model presented does not consider all the subsystems of the overall ETCS system ERTMS stands for European Railway Traffic Management System.The role of the RBC is to mediate between trains in terms of their

Movement Authority (MA). For the yard shown in Figure 2, the RBC employs the following strategy to assign MA to trains entering the yard from left to right. For any train entering the yard, the first MA ends before MB1The trains are the only components of the system that depend on time. We define two different models for the two trains that we have assumed as part of the system. Basic model of both the trains are same.Formal verification of the movement authorities issued by the track-side radio control block (RBC) is a significant step towards ensuring the overall safety of automatic train control systems

Using ultrasonic distance meter[19]to detect the flaws in the rail track using ultrasound testing method. When the crack is detected, respective coordinates are sent to the nearest station. This recording and sending of coordinates are done by GPS and GSM module. Ultrasonic technique is the most effective method which detects minor cracks and also calculates the growth rate of the crack. The growth rate can be detected at regular intervals. Non-destructive system for crack detection is implemented. One of the processes which help in the examination of material without causing any harm is non-destructive testing technique. NDT is a widely used method for material maintenance without dealing with the principles of the material. In this method, the ultrasound-waves are extensively used, due to the various behaviors as ultrasound waves displays in various material properties. When ultrasound .Every portion of Permanent Way inspected daily on foot. The types of patrolling are Gang patrol during abnormal rainfall, night patrolling during monsoon, hot weather patrolling for welded track, security patrolling, watchmen at vulnerable locations and cold weather patrolling. The impact of gang patrol during rainfall is on the length which should be likely to be affected. It is independent of other patrolling. Meteorological department issues telegrams of warning of storms/heavy rainfall. Watchmen and Gang mates are extra vigilant and are prepared to introduce patrolling. Security patrolling is done to protect train against tampering with track and obstruction on the line,to detect the flaws in the rail track using ultrasound testing method. When the crack is detected, respective coordinates are send to the nearest station. This recording and sending of coordinates is done by GPS and GSM module. Ultrasonic technique is the most effective system it even detects minor cracks and also calculates the growth rate of the crack. The growth rate can be detected after several observations at regular intervals. One of the processes which help in examination of material without causing any harm is non-destructive testing technique. NDT is widely used method for material maintenance without dealing with the principles of the material. In this method Ultrasound-wave are extensively used, due to the various behaviors as ultrasound waves displays in various material properties. When ultrasound wave signal propagates from one medium to another distinct medium, a certain proportion of the signal-energy propagates over to the other medium, at the same time the remaining energy gets reflected back.

The sensors consist of a couple of IR led, an Op amp, a transistor and a couple of resistors [20] A wireless sensor network (WSN) is a spatially distributed wireless network which is an autonomous devices using sensors to monitor physical conditions .This WSN system provides wireless connectivity to the wired world and distributed nodes (see Figure 1). The wireless protocoluses the frequency of 900 MHz. which is selected based on the application requirement. The standards using for the protocol include 2.4 GHz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards Railways connect cities and countryside and have played a significant role in the innovations. Thereare various problems faced by passengers travelling in train. Of the one is the lack of water supply in train. For passengers having long distance train travel, if there is lack of water in the train they have to travel either with limited water supply or with no water at all. Another problem is availability of seats in train. Passengers have to wait long way in queue to buy tickets for the train they wish to travel. If the passenger finds no seat to sit, the passenger will find it very hard totravel in train. The IR module consists of 358 comparator IC for the functioning. The output of the sensor goes logic one whenever it detects IR frequency and otherwise it goes logic zero. The status of the sensor can be checked using leds and no additional hardware is required. The first is an Infra-Red (IR) transmitter (usually an LED), while the second is an Infra-Red receiver (usually a transistor) So when passenger seat is

completely filled there is a reflected signal in IR led receiver. This indicates there is no empty seats available for upcoming passengers. If IR led did not detected any reflected signal it indicates the availability of seats for the new passengers. The output pin is normally low. Though the IR LED is continuously transmitting, due to no obstacle, nothing is reflected back to the IR receiver so, the receiver LED will be off. When an obstacle is encountered, the output of IR receiver goes low. TheIR signal is reflected from the obstacle surface. This will drive the output of the comparator to low. This output is then connected to the cathode of the LED, which then turns ON.

Sensor used for real time monitoring of railways[21] the development of railways in India dates back to seconddecade of the nineteenth century. India railwaysystem is an important lifeline in our country. Lights and fans can be on off by using special logic circuitry. An accident happening due to track breakage has been a big problem in railway sector. It is also need to design system for detecting obstacles such as cars, bicycles and human on the track in the range upto hundreds of meters ahead. In the proposed system includes the several features which prevent the train accidents. It saves the human life and it saves the electrical energy. The system has been implemented for the detection and controlling of railways accidents using the PIC controller. Actually the contribution of the Railways to the growth of the economy with its incredible services like mobility of various commodities and passengers has been ignored. The country's vastness and diversity hasbeen connected and coordinated by the largest and busiest rail networks in Asia, transporting over 18 million passengers and more than 2 million tons of freight daily. It is the world's largest commercial or utility employer, with more than 1.4 million employees. Indian Railways has become the lifeline for the country. Accident happening due to track breaking has been a big problem in railways sector. It is also need to designed system for detecting obstacles such as cars, bicycles, and human on the track in the range up to hundreds of mete ahead. Power consumption has to reduce in railway boogie as well as in tunnel. To implement real time monitoring and automatic control of different parameters related to railway. develop completely automated system with reducing the need of human involvement and to achieve energy

Advancement in railways[22] there were more advancement in the field of technology. Considering railway department, e-ticket facility was introduced where users browse through a governmental website and book their long journey railway tickets which can be printed out after confirmation to show it to the checker when needed. After which months before a new vtechnology called M-ticketing (Mobile Ticketing) was introduced where customers messaged to the web portal through mobile phones after which a complete web page download to the mobile phone where users can do the same booking process as it as in the e-ticketing facility. Also in foreign countries the use of Oyster cards & Octopus card has become mandatory during travel. But we suffer if we forget our travel cards and we stand in the Queue for our local suburban tickets, which is a place where e-ticketing; m-ticketing was unable lay their foot prints. Android is a software stack for mobile devices that includes an noperating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. It is a Linux-based operating system for mobile devices such as Smartphone's and tablet computers. Android has a large community of developers writing applications ("apps") that extend the functionality of the devices. Developers write primarily in a customized version of Java. Apps can be downloaded from third-party sites or through online stores such as Android Mobile Android Cloud to Device Messaging (C2DM) is a service that helps developers sends data from servers to their applications on Android devices. The service provides a simple, lightweight mechanism that servers can use to tell mobile applications to contact the server directly, to fetch updated application or user data. The C2DM service handles all aspects of queuing of messages and delivery to the target application running on the target device. error correction, it is possible to create artistic QR codes that still scan correctly, but contain intentional errors to make them more readable or attractive to the human eye, as well as to incorporate colors,

logos and other features into the QR code block.

RFID system for aviod collision[23] the railway transportation network is considered to be the safest and easiest network, but nowadays, it is not that much safer as the lot of collisions and accidents occur due to improper communication among the network, wrong signaling, worst weather condition, immediate change in track or route change. It is very difficult to stop such collisions because of speed of moving trains, which needs a lead distance to stop. There have been many train accidents all over the world. As per the report from CNN IBN India dates Sept 2011 85% of thetrain accidents are due to human errors. The main control room or driver before collision happens. Currently there is no solution to avoid train collision. Indian Railways have implemented solution based on ACD (anti-collision device) system. They have inherent problems in Station section and near mountains due to its design concept of using GPS for track detection and have high cost of implementation [2]. My system is used to eliminate train accidents by exploiting automated surveillance system, it is based on RFID, ARM Controller and GSM, which will help eliminate problems stated above. In this system each train track is identified by track id, every train reads and sends its track id.to nearby trains. If two trains are on same.

Internet Of Things	**Image Processing**	**Sensors**	**EPM**
A IOT approach to crack detection, reporting and navigation Station platform is specified using IOT	To capture the live video	Automatic crack Detection Automatic track changing Number of people counting	To reduce the speed of train and stop the train within the range specified

RAILWAY TRACK CRACK DETECTION TECHNIQUE					
Sl No	year	Paper name	Basic concept	advantage	disadvantage
1.	2009	Passenger Monitoring Model for Easily Accessible Public City Trams/Trains	public transportation, train, tram, passenger monitoring, passenger control, RFID distance Reading, ticket control, RFID ticket inspection.	It's possible to travel cross country with a single public transportation card, using Transport systems of several transport operators.	Applicable only for passenger monitoring
2.	2013	Way-side wheel crack detecting using arrayed ultrasonic probes	It will detect the wheel crack by using ultrasonic rays	It will eliminate the failure risks of wheels,	No cost effective
3.	2011	Crack Detection in Railway Axle Using Horizontal and Vertical Vibration Measurements	Investigations are carried out to assess the possible use of vibration measurements to identify	effect of various sources of disturbance, namely wheel out-of	High harmonic distortion

			the presence of a fatigue crack in railway axles	roundness, can be more easily dealt with.	
4.	2012	Robust Railway Crack Detection Scheme (RRCDS) Using LED-LDR Assembly	robust solution to the problem of railway crack detection utilizing	cost effective	In this the range IR sensor is very less
5.	2015	Automatic Railway Track Crack Detection System	addressing the issue by developing an automatic railway track crack detection system integrating an infrared red (IR) crack sensing module	crack is detected	It is not fully automatic
6.	2015	An Enhanced Crack Detection System for Railway Track	To detect the railway crack	Obstacle detection	This process take a more time
7.	2016	Review on railway track crack detection using ir transmitter and receiver	The defect information can be wirelessly transferred to railway safety management centre using a GSM module	Cost of the unit is less when compared to other , No fire hazard problem due to over loading	It cost is very high, sometimes signal receive not properly
8.	2017	Automotive Crack Detection for Railway Track Using Ultrasonic Sensors	Ultrasonic sensor is used to detect the crack in the railway track by measuring distance from track to sensor,	The auto crack detection method is more efficient in the technical field , Quick response is achieved	IR Sensor range IS .7 to 300 micrometers
9.	2017	Localization of an Unmanned Aerial Vehicle for Crack Detection in Railway Tracks	Localization of a UAV and how it can be applied for detecting cracks in a railway track using the concepts of image processing.	It find exact location of the crack	Technique used has a long process were the time interval is not sufficient

Sl No	year	Paper name	Basic concept	advantage	disadvantage
10.	,	Safety verification	RFID based	Distance	While

	2012	for train traffic control		traveled is effectively used	distance scanning alone will not be able to determine the actual number of free riders
11	2006	Autonomous Rail Track Inspection using Vision Based System	Image processing, rail track inspection	automatically find clips in video sequences and thereafter recognise	Disconnected pixels which are impossible to link together as a cohesive clip
12	2007	Condition monitoring of railway track and driver using in-service vehicle	GPS	Gps is used to analysis the vehicle vehicle services	This is totally based on data base
13	2005	*Research on alarm system of railway crossing based on GPS and GPRS*	GPS and GPRS	LCD display module and serial port operation module.	fare is equal to that of the voice calls, this is much vanished technology
14	2012	a robotic system for non-destructive evaluation of rcf cracks in rails using an acfm sensor	ACFM, RCF, NDE, Robotics	utilising ultrasonic, eddy current which was potential to improve the quality of RCF crack	autonomously to inspect the rail tacks was difficult due to wide range
15	2017	Rail crack detection based on the adaptive noise cancellation method of EMD at high speed	*acoustic emission; adaptive noise cancellation; empirical mode decomposition*	crack signals in varied speed conditions even with high speed	Due to the speed limit of test rig, the verified maximum speed is 124 km, it fail to detect the crack after it exceeds 124km
16	2015	Unmanned Level Crossing Controller and Rail Track Broken Detection System Using IR Sensors and Internet of Things Technology	,GSM modem, GPS module , IR transmitter and Receiver, Internet of Things technology	Unmanned gate crossing controller system used FM communication system and its having high performence	the level crossing at a distance of 1km. so there will be lot of time required

17	2014	Reliability Methodology and Theory for Development of Novel Railway Signalling Systems	radio-based, formal methods,	systems with high safety requirements such as Level-Crossing Control (LCC	All in one is proposed system so this much complex
18	2016	Formal verification of movement authorities in a Automatic train control system	track-side Radio Control Blocks (RBC)	RBC needs to consult the interlocking logic	RBC is to mediate between trains in terms of their Movement Authority (MA).

Sl No	year	Paper name	Basic concept	advantage	disadvantage
19	2013	Evolution of Railway Track Crack Detection System	GPS module; GSM modem; Ultrasonic distance meter.	The presented system helps to detect the flaws in the rail track using ultrasound testing method	The certain proportion of the signal energy propagates over to the other medium, at the same time the remaining energy gets reflected back
20	2017	Automatic Water level monitoring and Seat availability details in train using Wireless Sensor Network	Float water sensor, IR sensor, UART, Wireless Mesh Sensor Network	Water management is maintained by sensor. The IR sensor is used to check the seat availability	It requires low power supply for functioning and the performance isvery high.
21	2017	Wireless Sensor Network for Real Time Monitoring and Controlling of Railway Accidents	Wireless Sensor Networks, Energy consumption, IR sensor.	implementing real time monitoring and automatic control of different parameters related to railway	Power consumption has to reduce in railway boogie as well as in tunnel
22	2012	Android Suburban Railway Ticketing with GPS as Ticket Checker	Android; SQLite; Cloud Database; ASR; QR code	E-ticket facility,enabling reuse and replacement of	QR codes before the user enters or leaves the station,

				components..	where the user can have access which is risk in ticket booking
23	2016	Train Collision Avoidance System by Using RFID	RFID Tag, RFID Reader, GSM Module, Surveillance system based on ARM Controller and Android Device.	the main control room or driver before collision happen	it is not that much safer as the lot of collisions and accidents occur due to improper communication among the network, wrong signaling
24	2017	Novel Approach for Smart Indian Railways	Digitalization, Smart Railways, Aadhar card, Smartphone, Identity Verification.	The main objective of this paper is to employ a mobile application through which passengers can access various ticketing options in a user-friendly and efficient manner	This paper brings in the implementation of the Aadhar card, in the process of booking the tickets and the efficient identity verification of the passenger using the biometric data.

Problems to be addressed

In the litrature survey, it has been infered that, all the previous works on this topic either involves a system in which, the mechanism used to collect real time data such as camera, sensors etc. are all placed external to the railway track and train, and detection. Systems proposed, developed and implemented so far, hardly enable us to detect crack.crack detection systems are very few, and use methods such as detection of breaking intensity and communicating to other networks etc.

Proposed Framework

The proposed work consists of ARM processor based CC3200 microcontroller, sensor unit and a control unit.

In CC3200 has an inbuit UART setup, GSM modem and 32bit I/O ports. The 32 bit register bits are directly connected to ALU allowing two independent registers to be accessed for one single instruction executed during one clock cycle. A JTAG interface is available for Boundary-scan, On-chip Debugging support for programming.in our paper automatic track changing features added its will reduce man power. This paper also include automatic ticket booking using RFID tecnicque

It will save the time. It has another feature that is people counting it will allows only required number of people to inside the train when required number of people enter into the train it will automatically close the door.

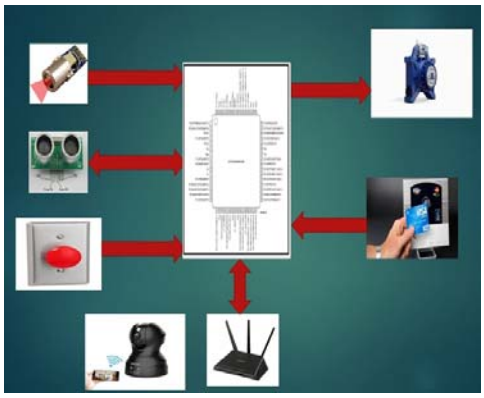

Figure:-Architectural Diagram for crack detection

Conclusion

By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle. By using this vehicle for the purpose of Railway track inspection and crack detection and automated SMS will be sent to pre-defined phone number whenever the vehicle sensors detect any crack or deformation. This will help in maintenance and monitoring the condition of railway tracks without any errors and thereby maintaining the tracks in good condition, preventing train accidents to very large extent Railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents.

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