**Proposal to Ministry of Railways on**

**Track Surveillence System for**

**Innovation Challenge for Indian Railways**

**Innovation Challenge for ‘New Idea/ Suggestion to improve the working of Indian Railways’**

**ABSTRACT:**

**Track Surveillance System is a cost effective yet vigorous solution to the problem of railway track geometry survey utilizing a method that is unique in the sense that while it is simple, the idea is completely novel and up till now untested. The project discusses the technical and design aspects in detail and also provides the proposed Innovative railway track surveillance with Sensors and controlled by wireless communication along with applications of automatic brakes in trains. This project also presents the details of the implementation results of the utilizing simple components inclusive of a GPS module, GSM Modem, MEMS based track detector assembly and Object detection using MAT Lab. Micro Electro Mechanical Switch (MEMS) are small integrated devices or systems that combine electrical and mechanical components. This sensors are used by many engineering disciplines because of their high-precision characteristics. Ultrasonic sensors are highly capable in monitoring obstacles in pathways and also for triggering automated devices. In addition, Global positioning System (GPS) receivers and Global System for Mobile communication (GSM) are widely used in geodesy. The statistics in the developing countries showing that 80% of worst collisions occurred so far is due to either human error or large scope for miscommunication. Oral communication through telephonic and telegraphic conversation. To demonstrate the gravity of the problem, official statistics say that approximately 60% of all the rail accidents have derailments as their cause, of which about 90% are due to cracks on the rails either due to natural causes (like excessive expansion due to heat) or due to antisocial elements. Hence using these GPS and GSM particularly for navigational purposes we herewith propose high standards of passenger safety by avoidance of train derailments and accidents.**

**WORKING:**

Track Surveillance System consist of the GPS module, GSM Modem, MEMS based track detector assembly, Ultrasonic sensor and Object detection using MAT Lab. MEMS consist of a central unit that processes data (the microprocessor) and several components that interact with the outside such as micro sensors. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include (1) the time the message was transmitted (2) satellite position at time of message transmission. The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites' locations define a sphere. The receiver is on the surface of each of these spheres when the distances and the satellites' locations are correct. This location is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Regardless of the frequency selected by an operator, it is divided into timeslots for individual phones to use. The 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 or HVQFN package. The 8/16/32 kB of on-chip static RAM and 32/64/128/256/512 kB of on-chip flash program memory. The 128-bit wide interface/accelerator enables high speed 60 MHz operation. In this process we using two section for surveying. They are (1) ROBOT SECTION (2) TRAIN SECTION. Bridge damage status is monitored by the sensor and wireless modules. In track, any shake/tilt in parallel bridge position is sensed by MEMS. If any obstacles, crack on the track detected by ultrasonic sensor. The GPS find the location of damage in track. RF Module used to transmit and receive signals from one section to another. RF receive signal from train section interface with µc. GSM used to send SMS to authority person. A relay is an electrical switch that opens and closes under the control of another electrical circuit. LCD is used to display the damage status on the track. Transmit the signal to the gate level section and to control the level crossings by DC motor interface with µc. Thus the alerts are used to trigger the brakes in the trains automatically upon sensing the damages and obstacles in the tracks that prone to cause derailments.This project proposes a cheap, novel yet simple scheme with sufficient ruggedness suitable to the Indian scenario that uses an arrangement to track geometry survey by using multi sensors, which proves to be cost effective as compared to the existing methods. These sensors very accurate detection will send information immediately by using GSM. The introduced surveying system is operational on both ballast and slab tracks. The system can be operated in tunnels without interruption.

**UTILITY:**

Indian Railways are the leading railway system of Asia and the second leading railway system of the world. In the India as compared with other sector railways are the biggest sector, which provides more employment. It is a convenient, chief and efficient public transportation system. In recent years train accidents and train derailment have been a great cause of concern. Around 76% of train derailment and accidents are due to poor maintenance of tracks and the human errors. Hence to stop such misfortunes this idea of a track surveillance system is being implemented. This method detects the passenger's or any animal movement on tracks. If a passenger is present on the tracks above the warning period of the approaching trains, the proposed method can successfully detect that and successfully start the broadcasting warning system to increase the safety on the tracks. This method is thus similarly applied for other objects that are prone to cause derailments to approaching trains.

**FEASIBILITY OF IMPLEMENTATION:**

The main objective of this project is to provide the multi sensor railway track surveillance system. Railway Bridge damage status is monitored by the sensor and transfer through wireless modules. For easy surveying and with less delay the information can be send to the authority. To avoid accident and to safeguard the people. ARM7, GSM, GPS and MEMS are used for geodetic measurement. Hence all the sensors used in this proposed system are easily available and their interfacing techniques have been tested and proved as compatible to various devices. The proposed system is not an additive to the existing system as one such is not available not implemented. Due to availability of resources readily the system implementation is highly feasible.

**EXISTING AND PROPOSED:**

The detection of cracks in railway tracks takes time consumption due to physical inspection. This method of design is having limited intelligence and time consuming. It is impossible to identify the obstacles from the train and if it is so difficult to stop the train suddenly. Our project deals with one of the efficient method to avoid train accidents by formulate solutions to the problem of railway crack finding. This technique is used for outside of base station with an automated system which does not rely upon the manual labor is fetched into bright. It proposes a solution to the problem of railway track crack detection by utilizing AT mega microcontroller, IR and Ultrasonic sensor, lcd display, GPS, GSM assembly to ensure robustness, repeatability and easy implementation. IR sensor and ultrasonic sensor are used to detect the crack as well as distance. In order to locate current position of the crack detected, GPS service is used. It calculates latitude and longitude of place and converts them into analog signals. To communicate the received information, GSM module is used that can be operated over large distance. Using this message is sent wirelessly to appropriate authority. Then indicating the detection of crack or obstacle, thereby track the exact location of track damage immediately so that many lives will be saved.

**ORIGINALITY OF THE PROPOSED:**

The proposed is the original idea of the team. The use of various sensors have been handpicked based upon various methodologies followed based on the sensor applications. No form of plagiarism has been in effect in this project based on our knowledge.

**COST EFFECTIVENESS:**

Our project deals with one of the cost and efficient method to avoid train accidents by formulate solutions to the problem of railway crack finding. It proposes a cost effective solution to the problem of railway track crack detection by utilizing AT mega microcontroller, IR and Ultrasonic sensor, buzzer, lcd display, GPS, GSM assembly to ensure robustness, repeatability and easy implementation, the principle idea has been kept very simple. The cost of AT mega microcontroller is Rs. 400 and the other sensors cost around Rs. 2000 – Rs. 5000. The Total Building cost of the system will be around Rs. 8000 – Rs. 10000. The operational cost will include electrical connections which can be reduced or made free upon longer operational period using Solar Power. The Total life time cycle of these systems will the most efficient and the cheapest of all.

**MAINTAIABILITY:**

As the scheme is completely automatic it can be used in remote villages where no station master or line man is present. It saves lot of time whereas manual systems take time for the line man to inform the station master to close and open the gate which will consume a considerable amount of time. In future work sensors like the CCTV systems with IP based camera for monitoring the visual videos captured from the track can be added to fasten the detection, we may also use the CCTV systems with IP based camera for monitoring the visual videos captured from the track. Thus the design is very useful in railway applications. But Upon any failure in the system the nearest neighbor system will inform the trains on the condition of alert that the original device is unable to track the details and hence the risk of accidents reduces. Easy maintainability and replacement is effective in this proposed system.

**CONSTRAINS:**

This proposed project include the network connectivity problems in remote forest areas and the access of any failure reasoning upon the system becomes difficult. No other major indications of constrain are feasible.