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An Efficient Way of Monitoring & Controlling The Train Parameters Using Pic18f4550 Controller

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ABSTRACT*: The main objective of this proposal is to automate control and communication systems of the train using* PIC18F4550 *controller. This method will overcome the difficulties faced by the existing methods such as detecting cracks at rails, monitoring distance between rails, compartments monitoring, fire and smoke monitoring in compartments, and controlling of motors, transformers etc; by automatic operations. One of the major accidents in the railway networks occur due to track side faults. To avoid this we are going to design the automated engine model. The automation techniques are based on two nodes, Track side node and Station side node. The proposed scheme has been modeled for Automation Engines in the Indian railway networks alone. This proposed system will speed up all the operations received data and it will be quickly processed by Multi-channel sensors with help of PIC18F4550 in order to monitor the Temperature, Smoke and to reduce human errors to get the fast response.*

Key Words: PIC18F4550 *Microcontroller, Wireless Sensor Nodes (WSN), Train Automation (TA), and Electric Locomotive Engine (ELE).*

I. INTRODUCTION

The basic objective of this project is to develop an automation engine which is used to find the detection of cracks in the railway networks. The Indian railway network today has a track length of 115,000 kilometers over a route of 65,000 kilometers and 7,500 stations. Though rail transport in India is growing at a rapid pace, the associated safety infrastructures are not up to international standards. So in this proposed model we are giving the solution for the detection of cracks. Train automation (TA) will strongly enhance the safety, speed, control, and characteristics of train in real time without requirement of physical manpower. Due to advent of Wireless communication technologies and high speed Powerful Processors, Automation will be done to satisfy flexibility, reliability, and efficiency of trains. We need to add a kind of intelligence to the train engines itself so that it tries to avoid accidents. TA provides us two techniques (1) Automatic train control (2) Automatic train protection.

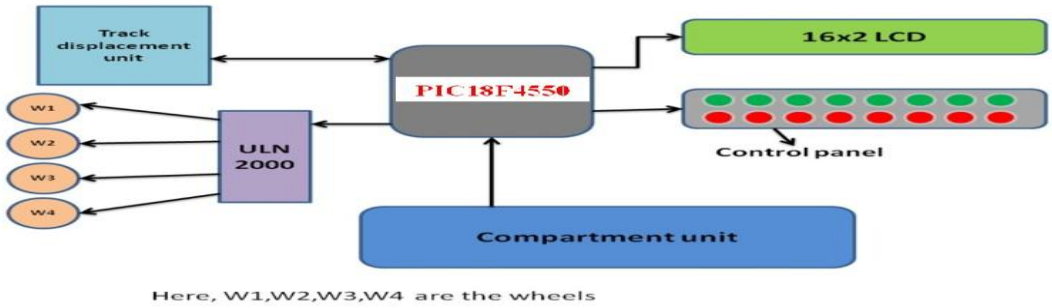
II. EXISTING METHODS

Monitoring fire accidents at coaches and other abnormalities will be tracked and processed with single processor or controller may give output with more delay as well as slow response. Monitoring electrical and thermal Parameters level in ELE manually will not be an efficient method. Detecting cracks at rails and checking track dimensions manually cannot provide excellent results. Although the modern trains have come up with latest technologies to run and control trains, PIC Controller which is interfaced with other methods will definitely give robust and precise operations.

III. PROPOSAL SYSTEM

This proposed system gives the efficient way of automating trains using PIC18F4550 Microcontroller along with other modules to reduce human operational errors, power consumption, high reliability, and fast operation without delay. It consists of hardware and software modules to execute the train operations.

FIG 1: BLOCK DIAGRAM OF PROPOSED SYSYTEM:



Here, W1,W2,W3,W4 are the wheels

IV. SYSTEM ARCHITECTURE

The system consists of many functional units such as Laser-based Ultrasonic rail flaw inspection unit; Track Dimensions monitoring unit; Electrical machines control unit; Monitoring of Electrical and Mechanical, Characteristics at ELE and Monitoring of compartments presence in wireless mode and by PIC18F4550 Micro controller. Here PIC18F4550 plays vital role i.e. it is heart of this proposed system. Every functional unit could be interfaced with PIC18F4550 using wired and wireless mode.

PIC ARCHITECTURE

PIC18F4550 is one among the advanced Microcontrollers from the Microchip technology. It is an 8 bit Microcontroller, which has been implemented with Nano WATT technology. Hence it requires very low power for its operation. It is remarked as advanced, as it uses well sophisticated protocols for communications. It has 256 bytes of EEPROM and 32KB of flash memory. The frequency limit for a PIC18F4550 is from 31 KHz to 48 MHz respectively. The Microcontroller comes with ADC comparators and other such peripherals as an in-built feature. It consists of up to 13 channels for Analog to digital converter (ADC). The converter accuracy amounts to 10-bit to convert Analog to digital signal relatively.

NON- CONTACT LASER-BASED ULTRASONIC RAIL FLAW INSPECTIONS CONTROL UNIT

In fact, train derailments caused by broken rails still occur. Defect monitoring may be affected by rail surface condition, railhead geometry, defect geometry and orientation, electrical or mechanical noise introduced into the transducer, and inadequate transducer-to-rail surface coupling. To avoid this problem, Non- Contact Pulsed Laser-based Ultrasonic rail flaw inspections Method is available. In particular, this method, consisting of a pulsed laser and an air-coupled transducer will be mounted at the front side of ELE. It has the following advantages:-

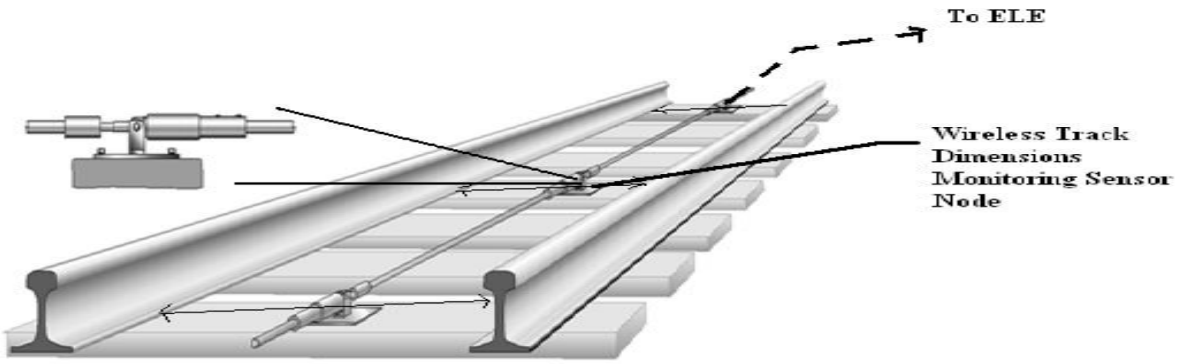
(1) Flexibility to discover cracks that are not detectable with methods currently available to the railroad industry.
(2) Inspection is non-contact and remote.
(3) Presence of oxides or oil on the rail surface enhances laser generation.
(4) Inspection speed can be higher than with contact methods.

Track monitoring system helps to maintain the safety of railroad tracks by monitoring settlement, twist, and distance Between two rails. The systems are installed as when nearby construction activities, such as tunneling or excavation, may affect the safety of the tracks. Railroad Track Dimensions Monitoring System View, the systems are also installed on tracks that pass through areas endangered by landslides or washouts. Due to availability of Track Settlement Sensors and Track Twist Sensors, this system will monitor the track in real-time and then data will be wirelessly transmitted to PIC Microcontroller for further processing to alert train controls.

RAILROAD TRACK DIMENSION MONITORING UNIT

Track monitoring system helps to maintain the safety of railroad tracks by monitoring settlement, twist, and distance between two rails. The systems are installed as when nearby construction activities, such as tunnelling or excavation, may affect the safety of the tracks. Fig.2 shows Railroad Track Dimensions Monitoring System View. The systems are also installed on tracks that pass through areas endangered by landslides or washouts. Due to availability of Track Settlement Sensors and Track Twist Sensors, this system will monitor the track in real-time and then data will be wirelessly transmitted to PIC18F4550 for further processing to alert train controls.

FIG 2:



TEMPERATURE & SMOKE MONITORING UNIT

Using Wireless Temperature and Smoke Sensor nodes at coaches, Locomotive will stop automatically if there is any Fire accident and smoke enters into the compartments. These nodes consist of sensors, RF transceiver, Microcontroller, and Power harvester i.e. solar batteries. Block diagram Fig 3 representation of motes at compartments. Here motes are called as wireless sensor nodes. The microcontroller always checks the threshold value in real-time, if there is any smoke, it quickly sends data to the receiver part of PIC18F4550 unit for further processing. It shows Wireless Temperature and Smoke Sensor node at compartment. PIC18F4550 has inbuilt ADC converters in it which converts Temperature and sends it to Control Panel.

FIG 3

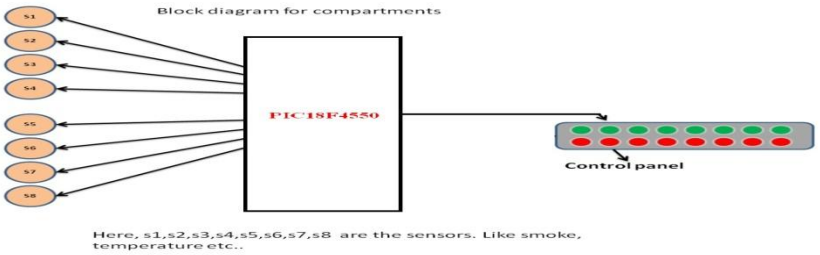
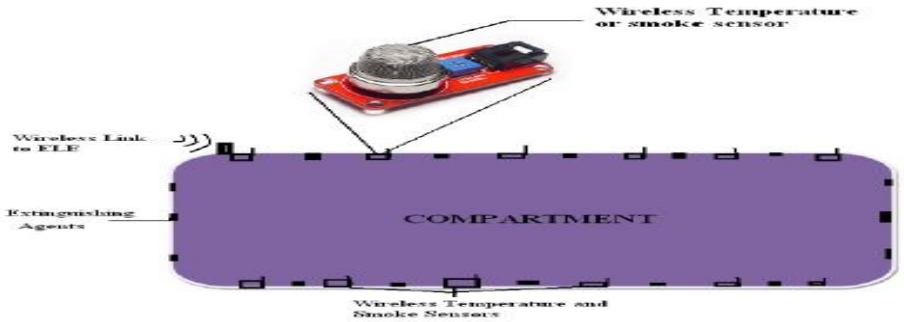


FIG 4:-



MISCELLANEOUS CONTROL UNITS

The Pantograph, DC Series Motors, Tap-Changing transformers will be automatically operated and controlled by PIC18F4550. Without presence of Loco pilots and Coach Guards, breaking both loco and compartments in real- time and Voltage/Current level monitoring will be done using PIC18F4550 with help of respective sensors placed at corresponding places. Using radio module, compartments will be monitored using

distance or proximity sensor nodes at two compartments linking point. Railway bearing acoustics monitor at loco uses advanced acoustic technology to monitor axle bearing defects with real-time analysis and trending software built-in allowing for optimum rail network performance. If there is any defects in bearing, loco will be stopped. Heat dissipation will be monitored using temperature sensors in ELE.

V. SOFTWARE MODULE OF THE SYSTEM

MPLAB X is not a new version of the current MPLAB IDE v8 framework but is instead based on Oracle's open source Net Beams platform. In addition to its predecessor's functionalities and compatibility with Microchip's existing development tools, the new IDE utilizes many Net Beans features allowing for user-interface improvements and performance upgrades. This also includes highly-anticipated cross-platform support in MPLAB IDE, allowing development for PIC microcontrollers on Mac OS X and Linux operating systems, in addition to Windows. This IDE also support the SDCC open source compiler on the three major OS (1) Mac (2) Linux (3) Windows. By using the MPLABX with SDCC one may be able to set up a complete free suite for programming Microchip PIC's in "C" language.

VI. CONCLUSION

Our proposed model is facing a new challenge to further improve the reliability of rail testing techniques, while seeking for new and emerging technologies in automation engines that aid the detection of rail defects. In the point of view of reducing human errors, and save the public's we are going to implement this proposed concept. This proposal gives better accuracy, very fast operation in Real-time, where the human life is very important. The proposed concept had already started to design and we are excepting the output. As per our proposed model using this automated engine design in real time means we can be able to easily avoid the accidents occurring by Track side faults.

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