RESEARCH ARTICLE OPEN ACCESS

Scaling The Effectiveness of Existing Techniques Towards Enhancing Performance of UWB Antenna

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ABSTRACT
This paper reviews an engineering techniques for the detection of faults in rail tracks, that are used in the application of fibre optic sensor which uses fibre optic sensors to replace track circuits for detection of damaged or broken rails. In this paper, we have developed fibre optic sensor system for efficient installation on rails and also detection of the rail breaks and track buckle.

Date of Submission: 09-08-2017 Date of acceptance: 11-12-2017

I. INTRODUCTION

Optical fiber sensing technology has drawn attentions worldwide and obtained a number of theoretical achievements in the last decade of rapid development. The ultimate aim in the development of optical fiber sensing technology is to display and exhibit its technical superiority, and therefore generate wide applications in industry. The research on engineering experiments should be recognized as a key step in translating technical development to industrial application, and therefore becomes one of the key technologies.

The advantage of using fibre-optic sensors is that they overcome some of the limitations associated with track circuits and may also provide greater sensitivity to rail breaks. We have for future development fibre-optic sensors for several novel applications such as speed detection, weigh-in motion, and wheel flat spot detection. In this project, we have built upon practical fibre-optic sensor systems, procedures, and equipment for efficient installation on rails, and investigate rail break detection, track buckles, and train presence using fibre-optic sensors. These applications of fibre optic sensors avoid accidents and loss of life by detecting breakage in advance and transmit the information about the breakage to remote systems also.

Fiber optic sensors show promise for several railroad applications. The fiber installation cart improves the practicality of field application. Further development has the possibility of using fiber-optic sensors for speed detection as well as weigh-in motion and wheel flat spot detection. Railroads have commented that, to be cost-effective, the application rate must be significantly increased beyond ten feet/minute, and the temperature range increased. An effective method of installing fiber over thermite welds must also be developed.

The specific accomplishments of this project were to:

- Determine which type of fiber is best suited for rail break detection, rail buckling detection, and train presence.
- Determine the optimum fiber location on the rail.
- Identify promising methods for attachment and removal of fiber from the rail.
- Conduct field testing of fiber-optic sensors to determine their potential for rail break and track buckle detection.
- Design, develop, fabricate, and conduct preliminary laboratory tests of a prototype detection system for train presence including algorithms, sensors, and associated software.
- Conduct field testing of fiber-optic sensors for train presence.

II. FIBRE OPTIC SENSOR PRINCIPLES

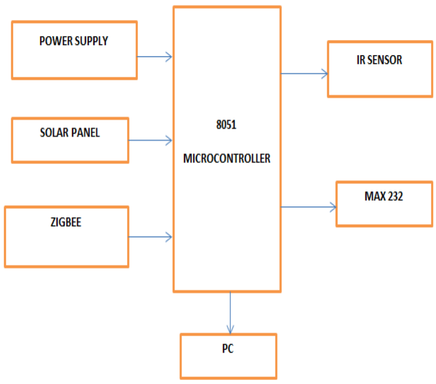
The general structure of an optical fibre sensor system is shown in Figure . It consists of an optical source (Laser, LED, Laser diode etc.), optical fibre, sensing or modulator element (which transduces the measured to an optical signal), some optical detector and processing electronics (oscilloscope, optical spectrum analyser etc.).

Fibre optic sensors can be classified under three categories: The sensing location, the operating principle, and the application.

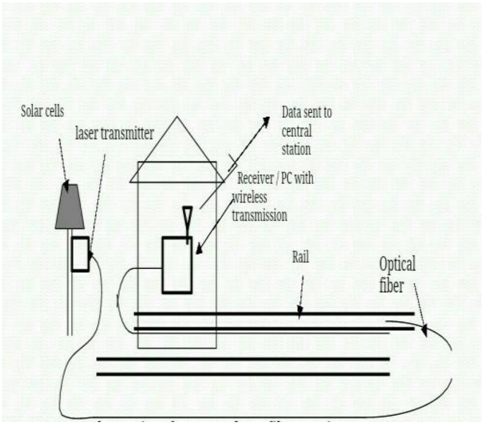
Based on the sensing location, a fibre optic sensor can be classified as extrinsic or intrinsic. In an extrinsic fibre optic sensor, the fibre is simply used to carry light to and from an optical device where the sensing takes place.

In this cases, the fibre just acts as a means of getting the light to the sensing location.

III. BLOCK DIAGRAM



IV. SCHEMATIC DIAGRAM



V. HARDWARE COMPONENTS

8051 microcontroller, 12V power supply, transformer, Voltage regulator-LM7805, LED, IR sensor, ZigBee Module, RS232, Solar panel

VI. WORKING

In this proposed system, we 8051 microcontroller. It is a low power, CMOS FLASH/EEPROM technology. It is also a low cost easy to program microcontroller. Before the start of the rail- way line scan the system is programmed to self-calibrate the IR Transmitter and Receiver. After calibration, the system waits for a predetermined period of time so that the on board ZigBee module starts reading. The principle involved in this crack detection is that light reaching the sensor is proportional to the intensity of crack i.e. when maximum light transmitted by IR transmitter reaches the receiver the crack intensity is more. The transmitter will be attached to one side of the rails and the receiver to the opposite side. During normal operation, when there are no cracks, the light from transmitter does not fall on the receiver and hence the set value is low. When the light from transmitter falls on the receiver, the value gets increased and the amount by which it is incremented will be proportional to the intensity of the incident light. As a consequence, when light from the transmitter deviates from its path due to the presence of a crack or a break, a sudden increase in the value can be observed. This change in value indicates the presence of a crack or some other similar structural defect in the rails. In order to detect the current location of the device in case of detection of a crack, we make use of a receiver whose function is to receive the current latitude and longitude data.

VII. METHODOLOGY

Techniques and methods involved in the proposed system includes:

Crack Detection: the prototype consists of the microcontroller and IR sensor. Initially microcontroller and IR sensor get activated with DC voltage +5v. IR sensor are having both transmitter and receiver module. Both the transmitter and the receiver must be placed at certain angle, so that detection of the object happens properly. The angle may be the directivity of the sensor which is +/- 45 degree with the distance of 5cm - 75cm. The potential difference is recognized by a microcontroller as HIGH or LOW. Transmitter transmit the light on track and receiver receive the light. Processor always check for ones it mean transmitted light again bounce back through receiver without any disturbance, then there is no crack. Is there any crack receiver won't get the signal light it mean crack on the track. Both the side of the tracks are sensing by the IR sensor. Depending on the track we can find out cracks on lift or right.

The input voltage for this is +5v particularly comparator LM358 are always checking, based on the threshold voltage it will detecting the crack. Here threshold voltage are fixed as 2.8v. As soon as the crack detected threshold voltage will goes low otherwise normally it is fixed threshold voltage based on this also we can check it out about crack on track

VIII. ALGORITHM

For Crack Detection

Step 1: the prototype is turned on

Step 2: Initialize the microcontroller, ZigBee, LED, LDR, IR sensor, libraries and all Peripherals

Step 3: Crack detected (either left crack or right crack) processor will always check for 1, if it is 1 no crack otherwise 0 it mean crack detected prototype will stop.

Step 4: Processor generate the actual problem information in the form of message and send it to predefined mobile number through ZigBee

Step 5: As soon as message received decoded that message ,abnormalities mentioned and transmitted.

IX. RESULTS

The sensors sense the crack and send the information to the microcontroller, where it responds and gives the command to the particular component with predefined algorithm, the time parameters are crucial which can be easily changed and modified using microcontrollers. To communicate the received information, a GSM modem has been utilized. The function of the GSM module being used is to send the current latitude and longitude data to the relevant authority as an SMS. When the crack is detected on the track the text message is send to the preferred number by using the ZigBee and GPS service. The text message contains the latitude and longitude value of the place where the crack is detected

X. CONCLUSION

By utilizing the benefit of embedded system and sensors is study to replace traditional flaw detection system. Detecting crack will be analyzed in the simulation platform using embedded system. The model which is carried out is working satisfactorily.The detection of crack is determined and fetch the exact location of abnormalities and send it to the concerned authority to immediate action.

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International Journal of Engineering Research and Applications (IJERA) is **UGC approved** Journal with Sl. No. 4525, Journal no. 47088. Indexed in Cross Ref, Index Copernicus (ICV 80.82), NASA, Ads, Researcher Id Thomson Reuters, DOAJ.

Sangeetha.P . "Scaling The Effectiveness of Existing Techniques Towards Enhancing Performance of UWB Antenna." International Journal of Engineering Research and Applications (IJERA), vol. 7, no.12, 2017, pp. 25-29.