Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IMPACT FACTOR: 6.017

IJCSMC, Vol. 6, Issue. 4, April 2017, pg.397 – 406

CAN BASED TRAIN TRACK CHECKER AND ACCIDENT PREVENTION SYSTEM

Shashank Kalra, Shashwat Kalra, Sangeetha A.

VIT University, Vellore, India

shashwatspl@gmail.com, sk.ca1996@gmail.com

ABSTRACT

In this project we give a special idea of anti-collision in train. In this project we demonstrate the idea of track crack checker and this information send to CAN (control area network) and display all condition and respective zone of track. And this information send to train that comes on same track and train automatically stops. other feature of my project railway track gate control automatically in case of train coming on track system automatically check the status of train distance according to distance system automatically operate the gate such as open and close. we provide the complete security of train from remote location.

I. INTRODUCTION:

Fiber-optic sensors have found wide usage in applications due to their high sensing performance and small size. Different types of fiber-optic sensors have been demonstrated for the measurement of properties such as temperature, pressure, vibration, and strain. Furthermore, with the advent of fiber-optic communication systems to support growing internet and data traffic, costs of fiber-optic components are continually decreasing. Research in fiber-optic sensors for railroad applications is a relatively new area and has progressed rapidly over the past five years.

FIBER OPTICS

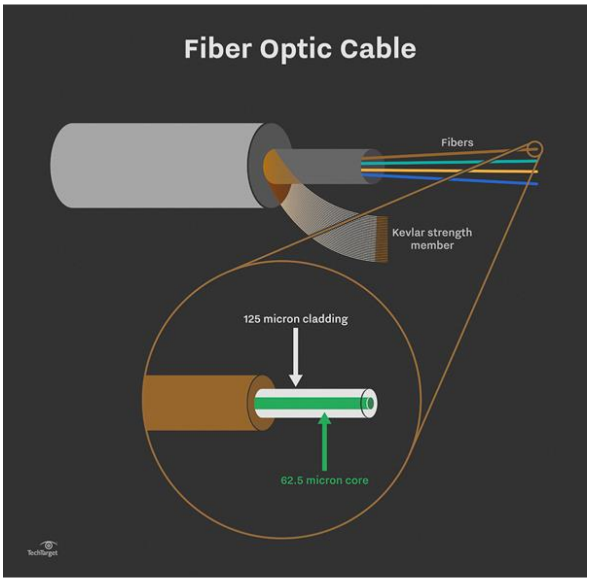
Fiber optics, or optical fiber, refers to the medium and the technology associated with the transmission of information as light pulses along a glass or plastic strand or fiber. A fiber optic cable can contain a varying number of these glass fibers -- from a few up to a couple hundred. Surrounding the glass fiber core is another glass layer called cladding. A layer known as a buffer tube protects the cladding, and a jacket layer acts as the final protective layer for the individual strand.

How fiber optics works

Fiber optics transmits data in the form of light particles -- or photons -- that pulse through a fiber optic cable. The glass fiber core and the cladding each have a different refractive index that bends incoming light at a certain angle. When light signals are sent through the fiber optic cable, they reflect off the core and cladding in a series of zig-zag bounces, adhering to a process called total internal reflection. The light signals do not travel at the speed of light because of the denser glass layers, instead traveling about 30% slower than the speed of light. To renew, or boost, the signal throughout its journey, fiber optics transmission sometimes requires repeaters at distant intervals to regenerate the optical signal by converting it to an electrical signal, processing that electrical signal and retransmitting the optical signal.

Types of fiber optics

Multimode fiber and single-mode fiber are the two primary types of fiber optic cable. Single-mode fiber is used for longer distances due to the smaller diameter of the glass fiber core, which lessens the possibility for attenuation -- the reduction in signal strength. The smaller opening isolates the light into a single beam, which offers a more direct route and allows the signal to travel a longer distance. Single-mode fiber also has a considerably higher bandwidth than multimode fiber. The light source used for single-mode fiber is typically a laser. Single-mode fiber is usually more expensive because it requires precise calculations to produce the laser light in a smaller opening.



Multimode fiber is used for shorter distances because the larger core opening allows light signals to bounce and reflect more along the way. The larger diameter permits multiple light pulses to be sent through the cable at one time, which results in more data transmission. This also means that there is more possibility for signal loss, reduction or interference, however. Multimode fiber optics typically uses an LED to create the light pulse.

While copper wire cables were the traditional choice for telecommunication, networking and cable connections for years, fiber optics has become a common alternative. Most telephone company long-distance lines are now made of fiber optic cables. Optical fiber carries more information than conventional copper wire, due to its higher bandwidth and faster speeds. Because glass does not conduct electricity, fiber optics is not subject to electromagnetic interference and signal losses are minimized.

In addition, fiber optic cables can be submerged in water and are used in more at-risk environments like undersea cable. Fiber optic cables are also stronger, thinner and lighter than copper wire cables and do not need to be maintained or replaced as frequently. Copper wire is often cheaper than fiber optics, however, and is already installed in many areas where fiber optic cable hasn't been deployed. Glass fiber also requires more protection within an outer cable than copper, and installing new cabling is labor-intensive, as it typically is with any cable installation.

FIBER OPTICS APPLICATION AND ADVANTAGES

Computer networking is a common fiber optics use case, due to optical fiber's ability to transmit data and provide high bandwidth. Similarly, fiber optics is frequently used in broadcasting and electronics to provide better connections and performance.

The main disadvantage of fiber optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

Fiber optics is a particularly popular technology for local-area networks. In addition, telephone companies are steadily replacing traditional telephone lines with fiber optic cables. In the future, almost all communications will employ fiber optics

Monitoring railways with optical fibers:

To ensure safe and cost-effective train operations in the transportation industry, it is essential to monitor both traffic levels and the condition of railways. Effective railway maintenance and inspection techniques must provide information about defects in rails and wheels. In the field of railway monitoring, optical fiber sensors are receiving increasing attention. These sensors use optical fibers either as the sensing element itself, or to relay signals from a remote sensor to the signal processing electronics.

Optical fiber sensors are immune to electromagnetic interference and have low invasiveness, i.e., because they are very thin (0.9mm outer diameter), the optical fiber sensors do not cause any extra load or modifications to the structures they are attached to. These devices are particularly useful as they can provide distributed sensing (spatially continuous) over large distances. Therefore, by attaching a single optical fiber over a rail, its whole length can be monitored continuously. The distributed optical fiber sensors can measure deformation (compressive and tensile strain) of the structures to which they are attached, as well as temperature.

II. RELATED WORK:

Chu-liang Wei, Chun-cheung Lai, Shun-yee Liu, W.H. Chung, T. K. Ho [01], Railway signaling facilitates two main functions, namely, train detection and train control, in order to maintain safe separations among the trains. Track circuits are the most commonly used train detection means with the simple open/close circuit principles; and subsequent adoption of axle counters further allows the detection of trains under adverse track conditions. However, with electrification and power electronics traction drive systems, aggravated by the electromagnetic interference in the vicinity of the signaling system, railway engineers often find unstable or even faulty operations of track circuits and axle counting systems, which inevitably jeopardizes the safe operation of trains. A new means of train detection, which is completely free from electromagnetic interference, is therefore required for the modern railway signaling system. This paper presents a novel optical fiber sensor signaling system. The sensor operation, field setup, axle detection solution set, and test results of an installation in a trial system on a busy suburban railway line are given.

Minghong Yang, Sheng Li, Desheng Jiang [02], The research on engineering experiment is a key step in translating technical development to industrial application. According to our practical experience for more than 30 years and some applications of the fire alarm system, bridge, coal and power safety ensuring system, this paper reviews on engineering technique problems in the application of fiber optic sensor and their solutions, which may provide some references for wider industrial applications.

H. Y. Tam, T. Lee, S.L. Ho, T. Haber, T. Graver, A.Méndez [03], They present results of a fiber optic structural health monitoring (SHM) system on an operational passenger railroad in Hong Kong. The system is based on a network of FBG sensors that measure strain and temperature in a multitude of critical locations. The sensors are mounted on guiding rails as well as on the under-carriage of passenger cars, using specially packaged strain sensors.

The system—which is fully operational and in present service use—is providing invaluable and timely information about stresses experienced during service, both static and dynamic, under different operational conditions. The sensors also provide information on the loading and traffic status of the passenger cars; temperature-induced stresses and deformations on rails and carriages; temperatures in and around axles and wheel brakes; dynamic axle vibrations due to corrosion and bearing wear; and other parameters relevant to railroad health monitoring.

T.K. Hoa, S.Y. Liua, K.Y. Lee, Y.T. Ho [04], Condition monitoring on rails and train wheels is vitally important to the railway asset management and the rail-wheel interactions provide the crucial information of the health state of both rails and wheels. Continuous and remote monitoring is always a preference for operators. With a new generation of strain sensing devices in Fibre Bragg Grating (FBG) sensors, this study explores the possibility of continuous monitoring of the health state of the rails; and investigates the required signal processing techniques and their limitations.

S. J. Buggya, S. W. James, R.Carroll, Jay Jaiswal, S. Staines [05], The ability to maintain rail networks and tramways poses substantial logistics and engineering challenges that are compounded by; increasing numbers of passenger traffic, longer operational hours (24 x 7 rail networks) and the drive for more energy efficient travel. Thus in this era where austerity measures are dominant, clever and novel engineering techniques for monitoring the critical, maintenance-intensive sub-components of these networks is essential. This paper presents an engineering solution using optical fibre sensors deployed on a network to present feedback from the system infrastructure that will give real time health and usage monitoring and will consequently allow for better management and maintenance. It will also lay the foundations for a dependable and connected intelligent infrastructure. Optical fibre sensors offer immediate advantages over more traditional techniques in their size, weight, EMI immunity, multiplexing capabilities and multi-parameter sensing capacities. The paper will report on current research of optical fibre sensing deployed in the railway sector and underline this with results from current trials on fish plated joints. It will demonstrate that an intelligent infrastructure is possible using current research and engineering solutions and proposes schemes that may be employed in achieving this ideal.

Lianshan Yan, Zongling Wu, Zhiyong Zhang, Wei Pan [06], Conventional fiber-Bragg-grating (FBG)-based sensor networks based on either wavelength- or time-division-multiplexing (WDM or TDM) schemes may suffer from low interrogation speed with moving mechanical parts or inevitable crosstalk between nodes with the same Bragg wavelength. In this paper, by incorporating both TDM and WDM schemes into matched FBG-based sensor networks and facilitated by the high-speed electronic platform, we achieve 400-kHz sampling speed for each sensor node with a 5-meter spatial resolution. Semidistributed strain measurement is demonstrated on a turbine blade model with results comparable to those by accurate spectral analyses.

Georges Kouroussis, Damien Kinet, Christophe Caucheteur [07], This paper analyses the implementation of fibre Bragg grating (FBG) sensors as vibration sensors along a rail in order to obtain usable signals of sufficient interest for weigh-in-motion and axle counting. Particular attention is also paid to the advantages of these new sensors. This study was completed by numerical analysis of the stress transfer caused by train passage to the track in order to better discern and understand the location and orientation of these sensors. Different data processing methods were tested to estimate the train speed and weight. The results obtained are compared to strain gauge data as well as train manufacturer data (for train axle loads) and video recordings (for train speed). A good agreement is observed between these different results, demonstrating the applicability of FBG sensors to monitoring applications.

KONATHAM PRIYANKA, V. TEJU [08], In the range of recent years, sensing technologies has expanded widely, whereas sensor devices have become cheaper. This led to rapid expansion in condition monitoring of systems, structures, vehicles, and machinery that are using sensors. Wireless sensor networks can now be used for monitoring the railway infrastructure such as bridges, rail tracks, track beds, and many track equipment along with vehicle health monitoring such as chassis, bogies, wheels and wagons. The wireless sensors network technology for monitoring in the railway industry is used for analyzing systems, structures, vehicles, and machinery. Main focus is on practical engineering solutions, identification of sensor configurations and network topologies.

Georges Kouroussis, Damien Kinet, Véronique Moeyaert [09], Structural health and operation monitoring are of growing concerns in the development of railway networks. Conventional systems of infrastructure monitoring already exist (e.g. axle counters, track circuits) but present some drawbacks. However, the use of optical fibre sensors, and more particularly fibre Bragg grating (FBG) sensors, becomes a realistic alternative due to their immunity to electromagnetic fields and simple multiplexing. The paper analyses the implementation of FBG sensors as vibration sensors along a rail in order to obtain usable signals of sufficient interest for weigh-in-motion and axle counting. This study is completed by a numerical analysis in order to better discern and understand the location and the orientation of these sensors from the stress transfer caused by the train passage to the track. Different data processing methods were tested to estimate the train speed and weight. The results obtained are compared to strain gauges data as well as train manufacturer data (for train axle loads) and video recordings (for train speed). A good agreement is observed between these different results, demonstrating the applicability of FBG sensors to monitoring applications. A particular attention is also paid to the advantages of these new sensors.

Angelo Catalano, Francesco Antonio Bruno, Marco Pisco [10], they demonstrate the ability of Fiber Bragg Gratings (FBGs) sensors to protect large areas from unauthorized activities in railway scenarios such as stations or tunnels. We report on the technological strategy adopted to protect a specific depot, representative of a common scenario for security applications in the railway environment. One of the concerns in the protection of a railway area centers on the presence of rail-tracks, which cannot be obstructed with physical barriers. We propose an integrated optical fiber system composed of FBG strain sensors that can detect human intrusion for protection of the perimeter combined with FBG accelerometer sensors for protection of rail-track access. Several trials were carried out in indoor and outdoor environments. The results demonstrate that FBG strain sensors bonded under a ribbed rubber mat enable the detection of intruder break-in via the pressure induced on the mat, whereas the FBG accelerometers installed under the rails enable the detection of intruders walking close to the railroad tracks via the acoustic surface waves generated by footsteps. Based on a single enabling technology, this integrated system represents a valuable intrusion detection system for railway security and could be integrated with other sensing functionalities in the railway field using fiber optic technology.

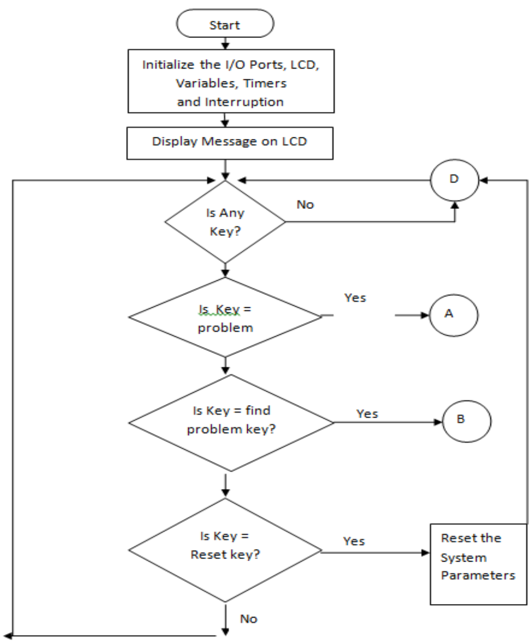
III. PROPOSED METHODOLOGY:

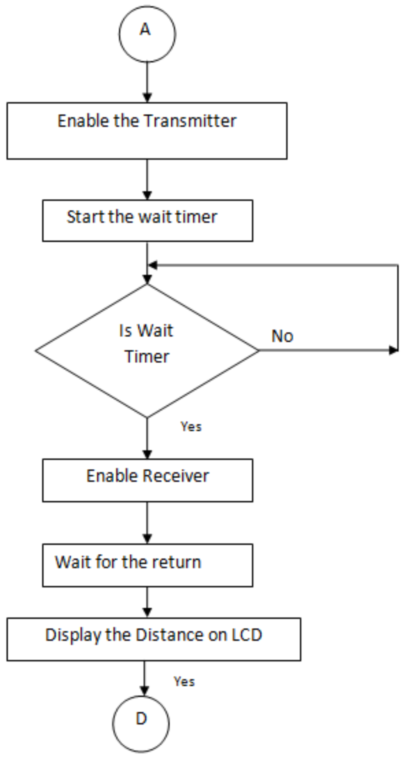
First of all to take the 220v from ac terminal and after that to give the signal step down transformer .and after regulator 7805 provide the fixed five voltages.

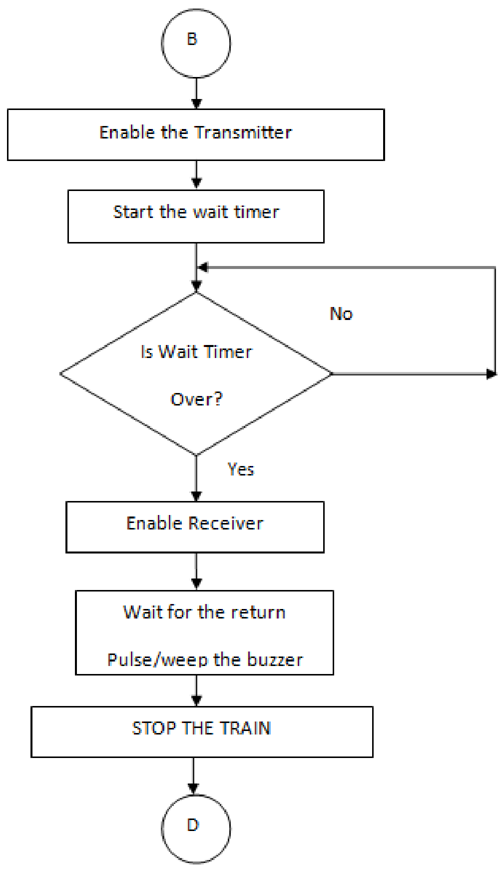
In case of accident problem train (ir sensor) automatically sense this problem and train automatically stopped by relay switching.

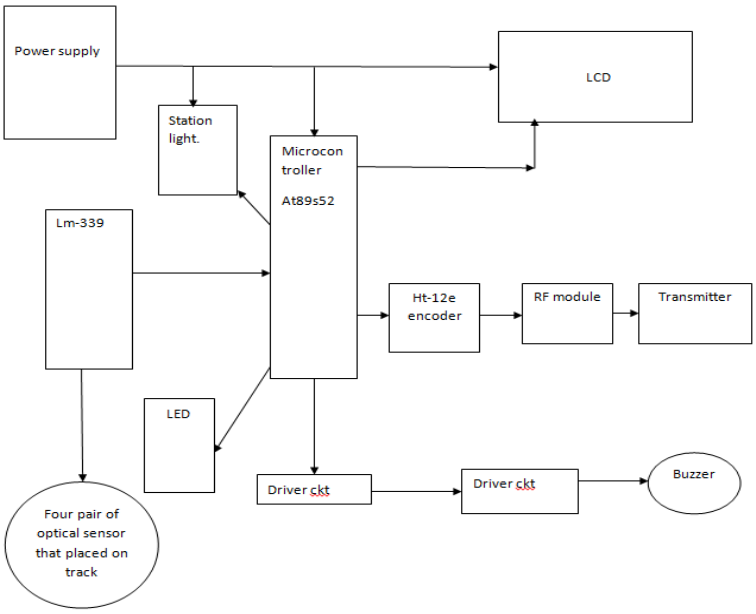
Train consist a special circuit module if any problem happened in train then train driver send this information in control room by pressing of switch this signal encode by encoder and transmit by rf module by fsk modulation technique.

At receiver end receive the signal decode and microcontroller display all message In display and weep the buzzer.




A
Enable the Transmitter
Start the wait timer
Is Wait
Timer
No
Yes
Enable Receiver
Wait for the return
Display the Distance on LCD
Yes
D


B
Enable the Transmitter
Start the wait timer
No
Is Wait Timer
Over?
Yes
Enable Receiver
Wait for the return
Pulse/weep the buzzer
STOP THE TRAIN
D



IV. Result Analysis / Implementation:

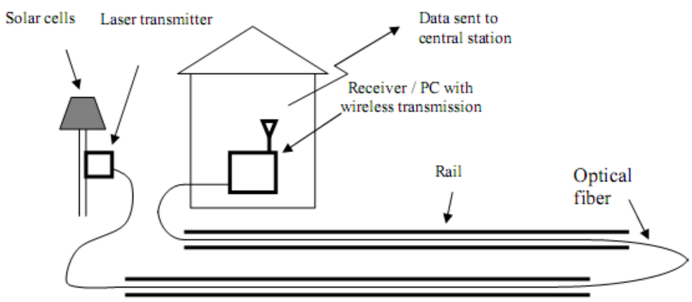


Fig: Schematic of a complete fiber-optic sensor system which includes the laser transmitter, fiber-optic sensor, photo detector receiver, and data acquisition components including a modem for wireless transmission, computer, and data storage and analysis software.

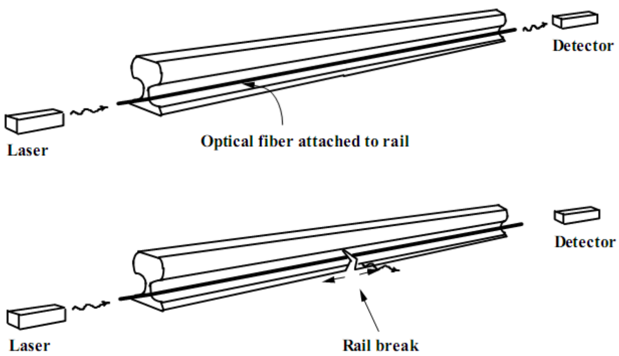


Fig: Concept of rail break detection. During a rail break, the fiber bonded to the rail also breaks and light transmission through the fiber decreases dramatically.

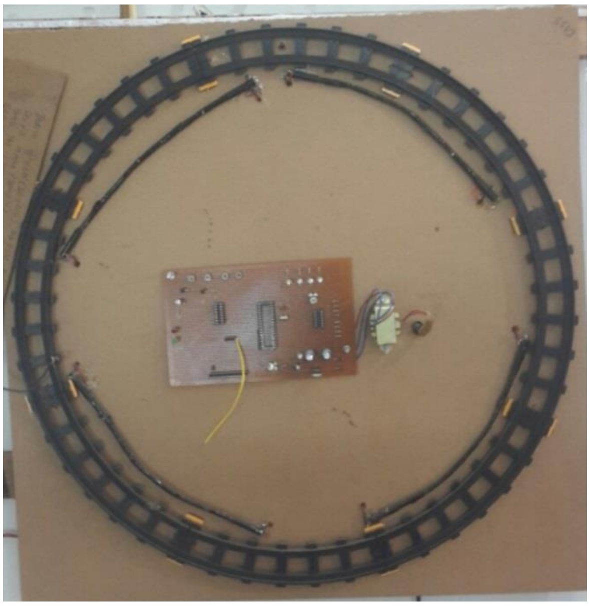


Fig: Model Output

V. CONCLUSION:

In this project we give a special idea of anti-collision in train. In this project we demonstrate the idea of track crack checker and this information send to CAN (control area network) and display all condition and respective zone of track. And this information send to train that comes on same track and train automatically stops. other feature of my project railway track gate control automatically in case of train coming on track system automatically check the status of train distance according to distance system automatically operate the gate such as open and close. We provide the complete security of train from remote location.

REFERENCES

[01] Chu-liang Wei, Chun-cheung Lai, Shun-yee Liu, W.H. Chung, T. K. Ho, **"A fiber Bragg grating sensor system for train axle counting"**,University of Wollongong, Faculty of Engineering and Information Sciences, 2010, IEEE Sensors Journal, 10 (12), 1905-1912,

[02] Minghong Yang, Sheng Li, Desheng Jiang**, "Review on Optical Fiber Sensing Technologies for Industrical Applications at the NEL-FOST",** 7th European Workshop on Structural Health Monitoring July 8-11, 2014. La Cité, Nantes, France,

[03] H. Y. Tam, T. Lee, S.L. Ho, T. Haber, T. Graver, A.Méndez, **"Utilization of Fiber Optic Bragg Grating Sensing Systems for Health Monitoring in Railway Applications",** Photonics Research Centre, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong, Kong SAR,

[04] T.K. Hoa, S.Y. Liua, K.Y. Lee, Y.T. Ho, **"An Investigation of Rail Condition Monitoring by Fibre Bragg Grating Sensors",** QUT Digital Repository, Hong Kong Institution of Engineers, Transactions, 16(2). pp. 9-15,

[05] S. J. Buggya, S. W. James, R.Carroll, Jay Jaiswal, S. Staines, **"Intelligent Infrastructure for Rail and Tramways Using Optical Fibre Sensors"**, canfield university, 14th November 2011,

[06] Lianshan Yan, Zongling Wu, Zhiyong Zhang, Wei Pan, **"High-Speed FBG-Based Fiber Sensor Networks for Semi-distributed Strain Measurements",** Fiber Sensor Networks for Strain Measurement, IEEE Photonics Journal, Volume 5, Number 2, April 2013, DOI: 10.1109/JPHOT.2013.2258143,

[07] Georges Kouroussis, Damien Kinet, Christophe Caucheteur, **"Railway structure monitoring solutions using fibre Bragg grating sensors",** International Journal of Rail Transportation, ISSN: 2324-8378 (Print) 2324-8386 (Online), 17 May 2016.

[08] KONATHAM PRIYANKA, V. TEJU, **"Railway Condition Monitoring System using Wireless Sensor Network",** International Journal of Science, Engineering and Technology Research, ISSN 2319-8885, Vol.05,Issue.29, September-2016,

[09] Georges Kouroussis, Damien Kinet, Véronique Moeyaert, **"Development of Structural Railway Monitoring Solutions Using FBG Sensors"**, 3rd International Congress on Sound & Vibration, 10-14 July 2016,

[10] Angelo Catalano, Francesco Antonio Bruno, Marco Pisco, **"An Intrusion Detection System for the Protection of Railway Assets Using Fiber Bragg Grating Sensors"**, ensors 2014, 14, 18268-18285; doi:10.3390/s141018268, 29 September 2014,