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Railway Security System based on Wireless Sensor Networks: State of the Art using Labview

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***Abstract*: Railways comprise a large infrastructure and are an important mode of transportation in many countries. The railways have become a new means of transportation owing to their capacity, speed, and reliability, being closely associated with passenger and goods transportation; they have high risk associated with them in terms of human lives and cost of assets. The poor maintenance of the railways can lead to accidents. New technologies for railways and better safety measures are introduced time to time but still accidents do occur. Thus, a proper strategy is required for maintenance and inspection of tracks.**

In this paper, different kinds of rail defects inspection and maintenance methods are described and a basic algorithm is readdressed that makes use of wireless acoustic sensors for detecting cracks and breakages in the railway tracks. Laboratory Virtual Instrument Engineering Workbench (LABVIEW) is a system design platform and development environment for visual programming language for National Instrument.

***Keywords*: Railway Security, Wireless sensor networks**

1. Introduction

Indian railway network spams over 63,140kms and has over 120,000 railway bridges in service. On this network 14 million people and more than a million tons of freight moves daily. Thus it is essential that all the aspects of this network are up and running securely and safe round the clock. Railway bridges are expensive to construct. Most of the bridges are made at structurally challenges places such as river beds, mountains etc. Indian railways spend more than 7.5 billion rupees for their maintenance every year.as per the data available amongst the 120,000 railway bridges 44% of bridges are more than 100 years old 74% i.e approximately 89,000 are more than 60 year old. Thus it becomes essential to monitor the health of these structure on demand and as frequently as possible. The life of a bridge is not dictated by its age but rather by its physical state.to identify and expeclite the maintance of its bridges. Indian railways has a system to mark bridges needing immediate rebuilding or rehabilitation as 'distressed bridges'.

2. Goal

The goal of the system is to record the structural response of a railway bridges toward different types of vibrations. These vibrations are recorded using accelerometers attached with the piers or other strategic locations of the bridges, to be designated by an engineer/consultant. Depending on the length and design of the bridge, accelerometers can be separated can be separated by a distance of 5-60m.

3. Sensor node

A general purpose of sensor node has a micro-controller for computation and control, a radio for communication a power supply(usually a battery pack) and a set of interfaces/ports to connect to sensors, actuatos or other application specific electronics or auxiliary circuits .these nodes are programmed either by connecting them to a computer or a special programming board. It is not uncommon to have certain generic sensors such as temperature, humidity and photo sensors located on the modes. Depending on type of application and cost involved it can also provide additional data memory, analog to digital and/or digital to analog converters. The sensor nodes fit in place of data logger and transportation back end. Depending on type of application and cost involved it can also provide additional data memory, analog to digital and/or digital to analog converters. Wireless sensor networks have been used numerous monitoring applications. Foremost are the Habitat monitoring applications such as the great duck island experiment studying the redwood tree macroscope project, zebanet etc.

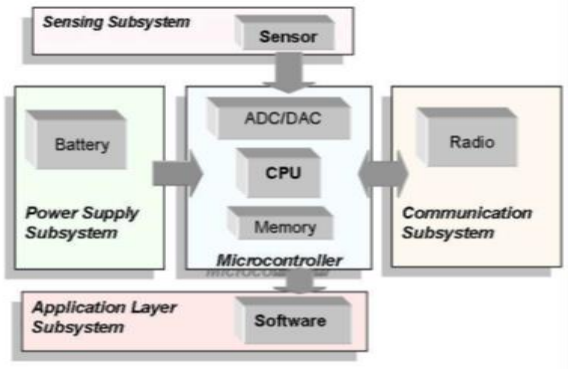

Fig. 1. Architecture of sensor node

4. Condition monitoring for fault detection

The design of a condition monitoring system can be compartmentalized into modules or task that define the condition monitoring system architecture.

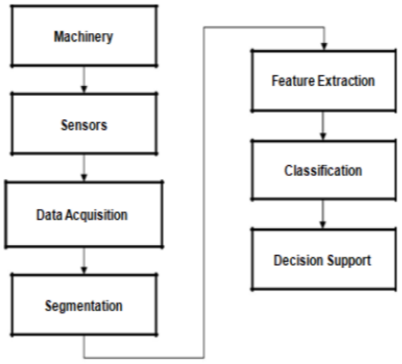

Fig. 2. Monitoring system architecture

Data acquisition is used to gather historical information of the sensor signals.the basic principal is that initially the machinery is healthy and exhibits a certain signal whereas damage exhibits a dissimilar signal that can be measured. In order to describe a large time series data sample in a compact form, one can extract statistical parameters forming what is referred to as a feature vector. any scalar or vector metric can be used to characterize the data segment.by defining well-suited featured vectors.it is intrinsic that the next stages in fault detection become simplified since well-suited features provide a better representation of machine condition than poorly selected features.

5. Detect system in railway station

The detect system aims to identify the basic events which lead to a threat. A different sensors collects basic events from subsystem to identify the sequences of events and then indicates the probability of risks; it can also be integrated with the warning system, trigger tool or security management software as illustrated in Fig. 1.

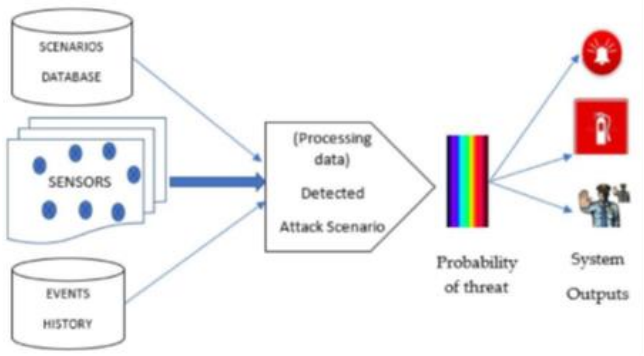

Fig. 3. Detect system in railway station

The anti-slipping device at railway station: A new anti-runway prevention system (ARPS) can improve the security in a railway system by preventing theft of the track skates. Testing of system shows the reliability of the communication distance. The system significantly saves employment costs due to the automatic recording and analysis of the status of the anti-runway function.

6. Passenger dynamic system

The passenger using the public transportation systems can become “crowd sensors “for the accurate information of traffic flows.

7. Railway operator communication

To maintain reliable, safe and secure operation the communication and signaling systems are used to monitor the security and safety of the train and passengers.

8. Fire systems and wireless

Fire presents a massive hazard to the railway industry, for both economic and social stability. The current fire detection and alarm system generally use technology to shape fire sensor networks. The system involves wireless multifunctional fire detectors and wireless control board and a fire Centre console.

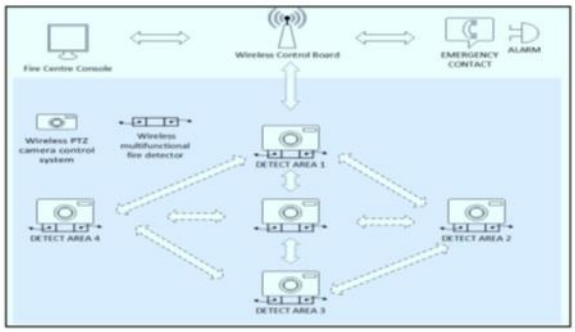

Fig. 4. Framework outline of a new wireless fire detection and alarm system

9. Conclusion

Accidents occurring in railway transportation systems cost a large number of lives. Many people die and several others get physical and mentally injured. Accidents are the major causes for traumatic injuries. There is certain need of advanced and robust techniques that can not only prevent these accidents but also eradicate all possibilities of their occurrence. Wireless sensor network which continuously monitors the railway track through the sensors and detect any abnormality in the track. The sensor nodes are equipped with sensors that can sense the vibration in the railway track due a coming train. The geographical positioning sensors are placed on the trains. These sensors send the train’s geographic location. The complete process is needed to be real time in nature and should meet the deadlines. Optimization of the communication protocol and real time working network with minimum delay in multi- hop routing from the nodes to the train using a static base station is needed, so that the decision making can be done and the decision is forwarded to the train without any delay.

References

[1] V.Reddy, “Deployment of an integrated model for assessment of operational risk in railway track”, Master Thesis, Queensland University of Technology School of Engineering Systems, 2007.
[2] C. Esveld, “Modern railway Track”. Second Edition, MRT Productions. 2001.
[3] D.Hesse “Rail inspection using ultrasonic surface waves” Thesis, Imperial College of London, 2007
[4] C. Campos-Castellanos, Y. Gharaibeh, P. Mudge, V. Kappatos, “The application of long range ultrasonic testing (LRUT) for examination of hard to access areas on railway tracks”. IEEE Railway Condition Monitoring and Non- Destructive Testing (RCM 2011) Nov 2011.
[5] Z Lorestani, S. A Mousavi, R. Ebadaty, “Monitoring Rail Traffic Using Wireless Sensor Network (WSN),” IJCSET ,June 2012, vol. 2, no. 6, pp. 1280-1282
[6] Aboelela, E. Edberg, W. Papakonstantinou, C. Vokkarane V, "Wireless sensor network based model for secure railway operations," Performance, Computing,and Communications Conference, 2006. IPCCC 2006. 25th IEEE International, April 2006.
[7] M. Kalaimathi, P. Ilakya & E. Sathiavathy. “Innovative railway track surveying with sensors and controlled by wireless communication”, International Journal of Advanced Electrical and Electronics Engineering, (IJAEEE), vol. 2, no. 3, 2013.
[8] J Zhao; Chan, A. H C; Stirling, A.B., "Risk analysis of derailment induced by rail breaks - a probabilistic approach," Reliability and Maintainability Symposium, 2006. RAMS '06. Annual, vol., no., pp.486-491, Jan. 2006.
[9] Seong Oun Hwang, “Content and Service Protection for IPTV,” Broadcasting, IEEE Transactions.