Monitoring and safety controlling of roadway bridge using PLC

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ABSTRACT

Nowadays, the number of vehicles has increased exponentially, but the load capacities of roads and transportation systems have not developed in an equivalent way to efficiently cope with the number of vehicles traveling on them. Due to this, road jamming and traffic correlated pollution have increased with the associated adverse societal and financial effect on different markets worldwide. A static control system may block emergency vehicles due to traffic jams. PLC have gained increasing attention in traffic detection and avoiding road congestion. PLC are very trendy due to their faster transfer of information, easy installation, less maintenance, compactness. There has been significant research on Traffic Management Systems using PLC to avoid congestion, ensure priority for emergency vehicles and cut the Average Waiting Time (AWT) of vehicles at intersections. In recent decades, researchers have started to monitor real-time traffic using PLC , IR sensor , DC motor , Lazers , Buzzer and infrared signals. This paper presents a survey of current roadways , Highway bridge & railway bridge traffic management schemes for priority-based signalling, and reducing congestion and the AWT of vehicles. The main objective of this survey is to provide a taxonomy of different traffic management schemes used for avoiding congestion. Existing traffic management schemes for the avoidance of congestion and providing priority to emergency vehicles are considered and set the foundation for further research.

Keyword : *PLC, Automation ,Bridge , Monitoring, Laser sensor.*

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1. INTRODUCTION

India has a large network of transportation which is the lifeline of business and all other things. In which road transportation is the most important and biggest network and it is the most important part of indian economy. Road transportation has so many parts which have important role in transportation. There are so many bridges developed on roads and railways by which the transportation can be made easy and fast. There is a most necessary part which is safety for the transportation of roads. In some past years we can see so many accidents which are happened due to overload on bridge or because of the underestimate the monitoring of bridge. The most needed thing for the transportation system is the monitoring and controlling of the bridges so that the system can made more secure and so many lives can be save.

Here we are planning a system in which bridge will be monitored all the time and traffic will be controlled as per the capacity of the bridge. In case more vehicles are entering on the bridge than the bridge will automatically stop the traffic. And in case any accident occur on the bridge than the gates will be automatically closed. Here we will monitor the state of bridge so that if any bending seen in the bridge than automatically bridge will be closed and an alarm will be raised.

2. LITERATURE SURVEY

Some failures are sudden catastrophic and come failures just take their time structured health monitoring can be very helpful in serving as an alarm system for preventing both type of failure. Bridge engineers need scientific tools which can give quick information about the health of bridge such instrument shall supplement the periodical manual inspections. But when failures happen with any kind of structure there is loss of human life's, money and many more.[1]

Traffic load monitoring (TLM) is one of important issues in bridge structural health monitoring (SHM), but there still exist such problems as lack of accuracy and efficiency for the existing methods. In this study, a sparse regularization approach is proposed for TLM based on analytical model and redundant dictionary. Firstly, an unknown moving traffic load is deemed as a combination of static and time-varying components so that a redundant dictionary can be established to independently express them. The static component is expressed by a basis vector whose elements are identical, and the time-varying one by wavelet functions for their good multiresolution analysis characteristics. Then, the TLM problem is converted to determine a coefficient vector of dictionary, and the l1-norm regularization technique is adopted to obtain a sparse solution to the coefficient vector. Finally, a series of experimental studies on a hollow steel beam bridge under crossing a moving model car are conducted in laboratory to assess the effectiveness of the proposed method. Furthermore, comparative studies are carried out for assessing the effect of different measurement parameters, such as moving car speeds, car weights, strain and acceleration response data, redundant dictionaries as well as selection of regularization parameters, on the proposed method. The illustrated TLM results show that the dictionary used for TLM in this study can independently distinguish the static and time-varying components of moving traffic loads. The proposed method can effectively identify the total weight of moving traffic loads with a higher accuracy, which provides a great potential for monitoring moving vehicle loads on bridges.[2]

Bridge management involves a variety of information from different data sources, including geometric model, analysis model, bridge management system (BMS) and structural health monitoring (SHM) sys- tem. Current practice of bridge management typically handles these diverse types of data using isolated systems and operates with limited use of the data. Sharing and integration of such information would facilitate meaningful use of the information and improve bridge management, as well as enhance bridge operation and maintenance and public safety. In many industries, information models and interoperability standards have been developed and employed to facilitate information sharing and collaboration. Given the success of building information modeling (BIM) in the Architecture, Engineering and Construction (AEC) industry, efforts have been initiated to develop frameworks and standards for bridge information modeling (BrIM). [4]

This paper proposed and implemented an efficient and reliable backup scheme for bridge monitoring systems. It is mainly using a wireless sensor network (WSN) to gather the related environmental parameters and to transmit the numerical data to the gateway through multiple-hopping relay. And then it further stores data in the back-end database for the professional monitoring staffs to analyze and study. Besides, the proposed backup scheme could also ameliorate the inconvenience to add or remove sensor nodes in an existing wired bridge monitoring network. At last, the feasibility of the proposed scheme is verified by experimental results.

This work aims to increase the understanding and bring the attention to the use of the so-called hybrid power line communication-wireless (PLC-wireless) channel, which is here defined as the equivalent channel that results from the concatenation of PLC and wireless channels, for data communication purposes. In this regard, we discuss about statistical modeling of average channel attenuation, root mean squared delay spread, coherence bandwidth and coherence time, which are among the main features used to characterize data communication channels. Based on a set of measured PLC-wireless channels in in-home facilities, which cover distances lower than 2 m and between 2 m and 6 m, and frequency band between 1.7 MHz and 100 MHz, statistical modeling of the aforementioned set of features is analyzed and compared when several statistical distributions are taken into account. Based on four well-established information criteria, we show the statistical distributions offering the best fits. Furthermore, we show that for the majority of these features, the best two statistical distributions for each of them achieve very similar performance in terms of the chosen information criteria and, as a consequence, both of them may be adopted to statistically model these features.[5]

3. SYSTEM ARCHITECTURE

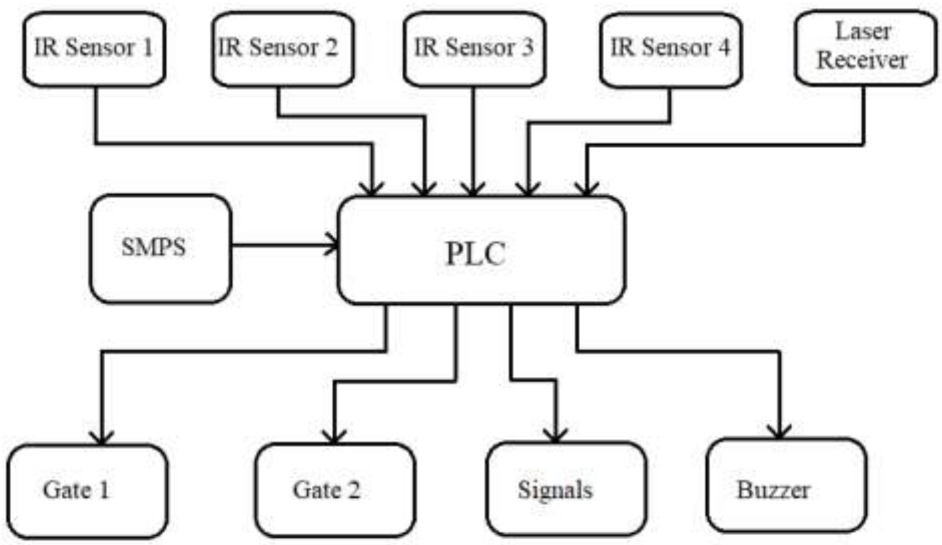

Figure: Block Diagram

As per the project model circuit diagram (fig. 3.1) we will provide three power supply taken from main power supply, 1st to dc motor in which 230 volt will be converted to 12v, 2nd to transformer in which 230 volt will be converted to 12v & 9v, 3rd to PLC in which 230 volt will be converted to 24/44v.
We will use sensor to count the no. of vehicles entering on the bridge and also the no. of vehicles leaving from the bridge. So that the total no. of vehicles will be counted and gates of bridge will be controlled as per the capacity of the bridge.

Here we are using laser's parallel to the bridge and if any displacement is seemed on the bridge or any bend due to over load of vehicle, the beam will break then path will be closed automatically and siren/buzzer will be turned on.

Traffic signals are provided to ensure an orderly flow of traffic on the bridge, which provides an opportunity for vehicles to cross an interaction and help to reduce the number of conflicts between vehicles entering intersections from different directions.

If any fault occurs on the bridge then that problem will be displayed on PLC screen and indication of problem will be given by using buzzer.

The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil. This will indicate us whether any cracks are developing on the bridge.

4. CONCLUSIONS

Our system mainly focuses on condition , monitoring, of bridge structure and track of bridge for avoiding any accidents to provide safety and also helps to reduce maintenance cost of bridge. This proposed system detects fault and defects immediately using PLC system and if system detects fault bridge will close by brigades. This system provides an adaptive, field demonstrated and appropriate in service monitoring for highway infrastructure. Through offering a concurrent platform for strength based as well as vibration based real time monitoring.

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