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IOT Based Bridge Monitoring System

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ABSTRACT

Bridge monitoring system is significant to health diagnosis of bridges and flyovers. This project is proposed and developed a novel architecture for large span bridge monitoring. A-3 level distributed structure is adopted in the monitoring system, which includes central server, intelligent acquisition node and local controller. Acquisition nodes are located across the bridge. One local controller manages all the acquisition nodes. Every acquisition node has 8 channels, which can sample displacement, line of site and vibration of bridge. To get high precision data, a 10 bits A/D converter. Compare to the traditional method, the proposed architecture has two features. First, the acquisition node is a smart device based on powerful controller. Signals of field sensors are analysed and real time compressed in the acquisition node. Only the processing results are sent to local controller through IEEE 802.11 wireless network. This operation can relieve load of central server. The intelligent monitoring system has run on a large span bridge. Running results show that the proposed system is stable and effective.

Keywords: IOT, Arduino, IR Sensor, Water Sensor, Wireless Sensor Network, Bridge Health Safety Monitoring, Alert Generation, Bridge Tracking Gadget (BMS), Harm Detection, Bridge Maintenance, Data Analysis.

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I. INTRODUCTION

Bridge is one of the most important transportation infrastructures for social and economic activities of country which has long rivers.

Bridge monitoring system (BMS) provides real time indication to us where we can easily save too many lives and we can avoid the loss. BMS is a tool to improve the safety and maintainability of bridge. BMS provides real time and accurate information about the structural health condition of bridge. It is a process of non-destructive evaluations to detect location and extent of damage, calculate the remaining life, and predict upcoming accident.

Internet of Things (IOT):

The Internet of Thing is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enable these things to connect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions.

II. LITERATURE SURVEY

The bridge safety monitoring system which monitors and analyzes in real time the conditions of a bridge and its environmental condition , including the waters levels nearby, pipelines, air and other safety conditions.

This project aims to simplify the system for selecting bridge tracking devices. Many bridges within India are obsolete or structurally deficient to safely increase the life of those bridges, inspection would be vital. Bridge engineers have many duties and it's far not possible to expect one to know. Our device will sense the crack inside the bridge and signal might be given to govern room immediately to stop traffic. The sensors and the LCD are interfaced with the Atmega(Microcontroller). The sensors used are Flex and Water level. The value is set so that if there is any sort of tilt or little crack and if it crosses our set value then the crack is detected. [1]

For developing bridge Health Monitoring System a 3-level distributed structure is adopted in this system which includes central server, intelligent acquisition node and local controller. Acquisition nodes are located across the bridge.

All the acquisition nodes are managed by one local controller. Every acquisition node has 8 channels which can sample displacement, acceleration and strain of bridge. Compared to the traditional method, the proposed architecture has two features. The acquisition node is a smart device based on powerful ARM processor. Signals of various sensors are analysed and real time the data is compressed in the acquisition node. Only the processing results are sent to local controller through wireless networks. This operation can relive load of central server and decrease demand of communication bandwidth. [2]

This system is composed of monitoring devices installed in the bridge environment; communication devices connecting the bridge monitoring devices and the cloud-based server a dynamic database that stores bridge conditional data; and a cloud-based server that calculates and analyses data transmitted from the monitoring devices. This system can monitor and analyse in real time the conditions of a bridge and its environment, including the waters levels nearby, pipelines, air and other safety conditions. The detected data and images are transmitted to the server and database for users to have real-time monitoring of the bridge conditions via mobile telecommunication devices. [3]

The system contains number of nodes and only one gateway sensor node. Each node is connected to one or more sensors. The topology of the WSNs can vary from a star network to multi-hop mesh network. In each node consisting several important parts: a microcontroller, a radio transceiver with an internal antenna or connected to an external antenna, an electronic circuit and power unit or battery. In this project two wireless sensors are used which is accelerometer sensors and ultrasonic sensor. These two sensors are collecting the information about bridge structures. This sensor data is transmitted to the central station. For uploading the data to static IP address visual basic software are used and after that, develop the android application to send condition and situation of the bridge structure to the community. [4]

III.PROPOSED SYSTEM

The system gathered data from sensors and the status is collected by the controller and is transferred through wireless network. This data is sent to the server and is analysed by the Arduino. Analysed data is sent to the management centre and an alert message is sent to the operator device.

We will use sensors like IR sensor, water level point contact sensor as sensing devices. These sensors will be responsible for sensing the load on the bridge, pressure of the water, level of the water rising in the river. The sensory data will get converted into an digital signal. The devices which generate output are generally called as actuators (sound buzzer). Both sensor and actuator are collectively called as a transducer. The electrical signal will get transmitted to the Arduino.

The server will receive data from a microcontroller using Wi-Fi module, then it will transfer the data further to the web application using a servlet.

A servlet is a small Java program that runs within a Web server. Servlets receive and respond to requests from Web clients, usually across HTTP, the Hyper Text Transfer Protocol.

In this way, the admin will get the data and alert will be generated through buzzer and auto barrier on the bridge. If it is necessary then the admin give instruction for necessary actions for maintenance.

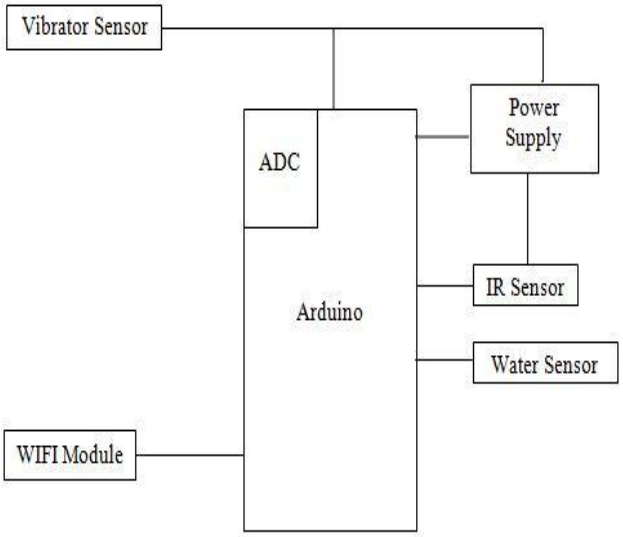

Fig 1: Block diagram of IOT using Bridge Monitoring System.

IV.SYSTEM ARCHITECTURE

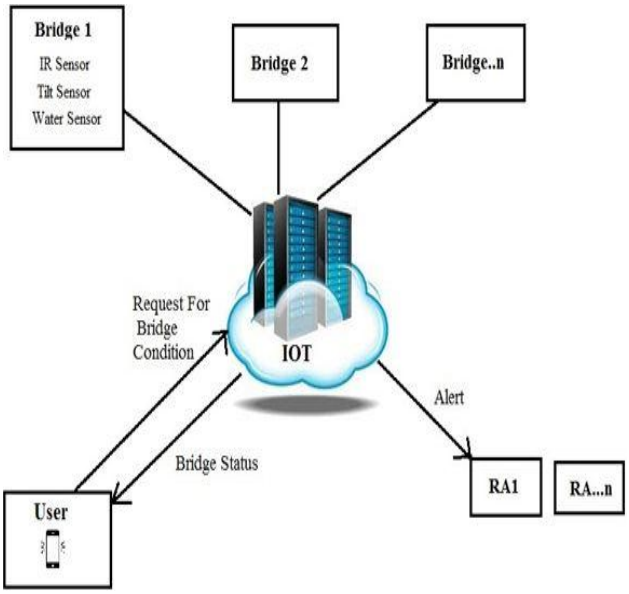

Fig 2: System architecture of IOT using Bridge Monitoring System

ADVANTAGES

- Proposed system will avoid death of people due to bridge collapse.
- We notification about which bridge requires for maintenance before it gets unwanted incidence.
- Traffic can be routed prior of Bridge collapse as alert of extreme levels are continuously monitored on IOT server.
- It generates the alert if flow, water level, and the load are increased.
- It saves the life of people.
- It provides real time data of the load, water level, and pressure.
- Early damage detection, Quick action and responses.

APPLICATION

System can be implemented on any bridge for monitoring real time information about health of bridges but specially design for old constructed bridges which may be collapse.

V. CONCLSION

Bridge Monitoring and alert generation system using IOT, to alert using buzzer and auto- barrier when there are signs of collapsing the bridge. This system will help to reduce big disasters in future. This system can save the lives of many people as well as property loss.

IV. FUTURE SCOPE

System can be implemented at global level in which different countries can manipulate data of their bridges at a single government server.

REFERENCES

[1] Ms. Arohi D. Sonawane, Ms. Pooja P. Vichare, Mr. Shubham. S. Patil and Mr. Nitin. P. Chavande, "Bridge Monitoring System Using IOT", MAT Journals of Advances in Electrical Devices Volume 3, Issue 2, 2018.

[2] Ashwini R, Sneha Shivan and Mesta, Varsha A U , Ravichandran G, Haritha K, Sivaraman, "Bridge Monitoring System Using Wireless Networks", IJARJJE ISSN Vol-2 Issue-5 2017.

[3] Jin-Lian Lee, Yaw-Yauan Tyan, Ming-Hui Wen, Yun-Wu Wu, "Development of an IOT- based Bridge Safety Monitoring System", International Conference on Applied System Innovation IEEE-ICASI 2017.

[4] Miss. Pooja Krishnath Patil, Prof. Dr. S. R. Patil, "Structural Health Monitoring System using WSN for Bridges", International Conference on Intelligent Computing and Control Systems ICICCS 2017.

[5] Varsha Kusal, Amrita Argade, Sanika Chiplunkar, Rohini Kumbhar, Swati A. Khodke, "Bridge Monitoring and Alert Generation System Using IOT", International Journal Of Advance Research, Ideas And Innovations In Technology Volume 3, Issue 6, 2017.

[6] Mr. Anand Kumar Jha, "Bridge Monitoring System", International Journal of Innovative Studies in Sciences and Engineering Technology (IJISSET) Volume 2 Issue 12 December 2016.

