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IOT Based Bridge Monitoring and Alert Generation System

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***Abstract* - Numerous numbers of bridges in cities are constructed on the river are subjected to decline as their lifespan is ended nonetheless, they are yet in practice. They are risky to bridge users. Due to heavy burden of vehicles, high water pressure, heavy rainfall these bridges might not get breakdown which in turn leads to disaster. So, these bridges need continuous observation. So, we are proposing a system which consists of a weight sensor, water level point contact sensor GSM module, and microcontroller. This system senses the capacity of vehicles, water level and pressure. If the load of the vehicle, water level and pressure on the bridges cross the threshold value then it produces the alarm through beeper. If the authority needs the live picture near the bridge for many purposes at any time, he can capture by using IOT application. For every alert from the bridge, we will play the voice messages regarding the events which exceed the threshold value from any bridge. If it is required, then the supervisor may allot the task to staffs for maintenance.**

Keywords: Bridges, water level, pressure, IOT, Bridge Monitoring, Alert Generation.

I. INTRODUCTION

Engineering structures are responsible for economic growth, development, and evolution of the nation. The structure includes buildings, dams, roads, and bridges which affect day to day a life of people. Along with their own weight, they are also affected by the environment. Scour is also one of the major causes of bridge failure. In 2016, a bridge collapsing incident occurred on Savitri River in Mahad district due to sudden floods in the river. Apart from this, the problem of collapsing may arise on airport boarding bridges.

Structural health monitoring system is one of the best popular systems which is monitoring and detect the environmental condition. The bridge structure may vibrate under the action of such dynamic load as moving vehicles, crowds, wind and earthquake.

Bridges and flyovers are critical in many regions, being used over several decades. It is critical to have a system to monitor the health of these bridges and report when and where maintenance operations are needed. Advancements in sensor technology have brought the automated real-time bridge health monitoring system. Many long span bridges in Korea and in Japan have adopted this real-time health monitoring system. However, current system uses complicated and high cost wired network amongst sensors in the bridge and high-cost optical cable between the bridge and the management centre, which increases the overall cost of installation and maintenance cost of health monitoring system. The complicated wiring also makes the installation and repair/replacement process difficult and expensive.

1.1 Literature Review

The safety management bridges that exist have the problems like: Failure to gather data or monitor on the spot situations in real time. Data collection through visual assessments or use of large size electronic equipment have higher cost or higher power consumption, often resulting in inaccurate data. Traditional, direct approaches are to collect acceleration signals by installing sensors on a bridge. The drawback of such direct approaches is that they require a sophisticated and expensive electronic infrastructure with installation, maintenance and power support. Moreover, although it is easy to get a large number of data samples, it is expensive to label them. Thus, very few data samples are actually. This real-world constraint turns the indirect bridge SHM into a semi supervised classification problem.

1. Development of an IOT Based Bridge Safety Monitoring System, Jin-Lian Lee, et al.

IoT-based bridge safety monitoring system is developed using the ZigBee technology. This system is composed of: (1) monitoring devices installed in the bridge environment; (2) communication devices connecting the bridge monitoring devices and the cloud-based server; (3) a dynamic database that stores bridge condition data; and (4) a cloud-based server that calculates and analyses data transmitted from the monitoring devices. This system can monitor and analyze 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-

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time monitoring of the bridge conditions via mobile telecommunication devices.

2. Design of a WSN platform for longer environ-mental monitoring for IoT applications, M.T. Laz.

This paper presents the functional design and implementation of a complete WSN platform that can be used for a range of long-term environmental monitoring IoT applications. The application requirements for low cost, high number of sensors, fast deployment, long lifetime, low maintenance, and high quality of service are considered in the specification and design of the platform and of all its components. Low-effort platform reuse is also considered starting from the specifications and at all design levels for a wide array of related monitoring applications.

3. Design of wireless sensor network-based monitoring system for bridge control, J. Zhang et al.

This paper presents the design and implementation of a wireless monitoring system for building smart room architectures in home environments. The proposed system consists of wireless sensor nodes and actuator nodes which are organized into a monitoring network by ZigBee protocols. A base station and some general wireless nodes have been developed to form a prototype system. Various sensor and actuator modules have also been implemented to enable some typical indoor monitoring applications such as resident tracking, energy-efficient home appliance control and home security. The proposed system provides a flexible solution for us to make our living spaces more intelligent.

1.2 Objectives

The objective of the system is to

- Continuously monitor the bridges,
- Sense the environment and send the data to web application through the server,
- Generate the alert with the help of buzzer and auto barrier if load of vehicle and level of water in river crosses the threshold value.

1.3 Problems Statement

Flyovers and highway bridge systems are critical in many regions, being used over several decades. It is critical to have a system to monitor the health of these bridges and report when and where maintenance operations are needed. Advancements in sensor technology have brought the automated real-time bridge health monitoring system. The complicated wiring also makes the installation and repair/replacement process difficult and expensive.

In this project an idea of bridge monitoring system using wireless is proposed. To develop a pervasive system to monitor.

II. METHODOLOGY

In this system, the weight sensor, water level sensor is used as sensing devices. The sensors are responsible for sensing the data like load on the bridge and level of the water. Crack detector is used to detect the crack in bridge. This sensor is installed on different parts of the bridge. As shown in the figure 1.

System will collect the data from the sensing devices. The data sensed by this sensor are converted into electrical signals. Then the signal is transferred to the microcontroller through the wireless network. Server received data from microcontroller and is then transferred to web application using servlet.

A servlet is small c program that runs with in web server. Servlets receive and respond to requests from web clients, usually the Hyper Text Transfer Protocol (HTTP). Through the server, admin got the data of the bridges and in this way, he monitored the bridges. If the values of weight, water level cross the threshold value, then alert generates through the buzzer.

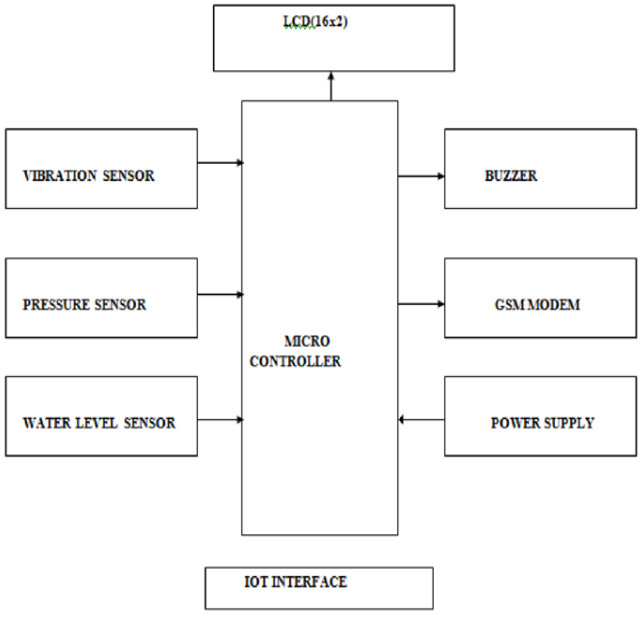

Figure 1: Block Diagram

If any of the above parameter crosses the threshold value the alarm is generated through the buzzer, and displayed in the LCD display. Then the location in which the damage is happened is send through IOT.

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III. RESULT

Here we are using water level sensor, pressure level sensor, vibration sensor for sensing the type of defect is happening. Buzzer is used to alert generation. If the water level increases or the weight of the vehicle increases the water level sensor or weight level sensor gives the alarm through buzzer. The system collects the data from the sensors and is transferred to wireless network. This data transmitter is sent to the receiver and is analyzed by Arduino. Analyzed data is sent to the management canter and alert is generating through the buzzer. Both the sensor and actuator are collectively called as a transducer.

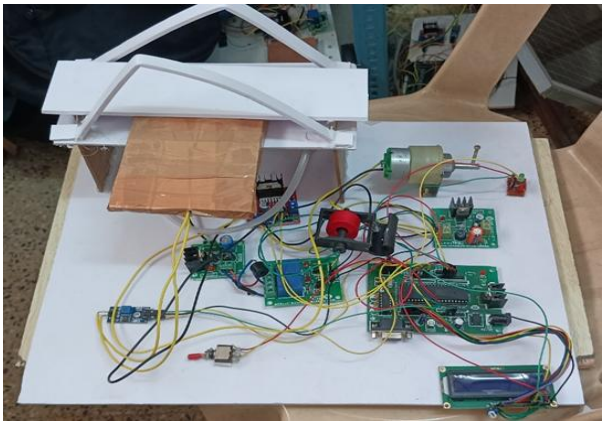

Figure 2: Hardware Image

IV. CONCLUSION

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.

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