

A Novel method for Bridge Safety Monitoring System

S. Pothumani, R. Kavitha

Abstract: Progressions in sensor innovation have brought the programmed ongoing scaffold wellbeing observing framework. Numerous broad range connects in Korea and in Japan have embraced this ongoing wellbeing observing framework. In this, another thought of scaffold wellbeing checking framework is present. For short separation (among sensors in the extension) TCP/IP remote system is tried, and CDMA for long separation (between the scaffold and the administration focus) information message is tried.

Keywords: Monitoring Centre, TCP/IP, IoT, WI-FI Module, Sensors

I. INTRODUCTION

Now a day it is very essential to monitor, the bridges in our country or state as there were incidences occur earlier. The reason behind the these incidents as there is no such kind of system, which will give information to the peoples if the bridge is not in good condition when sudden situations may occurs like flood, earthquake. It means that the bridge is not in nontoxic condition. When such situation rises, bridge may be collapse, which causes much kind of losses like accidents, human deaths, etc. This happens because there is no effective system in existence, which will provide notification about conditions about current condition of bridge when bridge is not in safe mode.

II. RELATED WORK

In the existing systems, Zig-Bee technology was used which is cost consuming and quite time consuming. But this system used the TCP/IP protocol which is suited for all types of bridges. Here, The water level sensor is used through which system has to check manually the level of water. So for this the system is being developing an application in whichever thing is automated so less human efforts are required and this application is very much useful in the disaster condition like prevent from flood, earthquakes. The system established in this study can help to promote the advancements of bridge safety management. This system purposes at developing an application that is useful for the people working at the bridge department or for bridge engineers.

III. SYSTEM ARCHITECTURE

The main objectives of the Bridge Monitoring System are:

- To provide safety for bridges.
- To avoid accidents in case of heavy rainfall.
- To improve the bridge efficiency.
- To overcome the technical and cost obstacles.

This system consists of following parts:

1. **Wi-Fi Module** - Through Wi-Fi module the status of the overall bridge will be referred to the monitoring system.
2. **Vibration sensor** - Vibration sensor intelligences the condition of bridge, whether it is in better condition or not.
3. **Water level Transmitter sensor** - It is used to sense the marine level status.
4. **Barriers with servo motor** - If water level enlarged or the bridge becomes vibrate then barriers with servo motor will close.
5. **Management Centre** - All the necessary information linked to status of the bridge is send to and monitor by Management centre.

As shown in the Figure 1 the communication between bridge and monitoring Centre is takes place via WI-FI module. The WI-FI module itself act as sever through which status of condition of bridge is transmitted to the monitoring Centre. The Monitoring devices like water level transmitter and vibration sensor are continuously monitoring the structural health of bridge. If water level increased and if bridge is being vibrated then barriers with servomotor will close and at the same time, status of bridge condition is directed to the monitoring Centre.

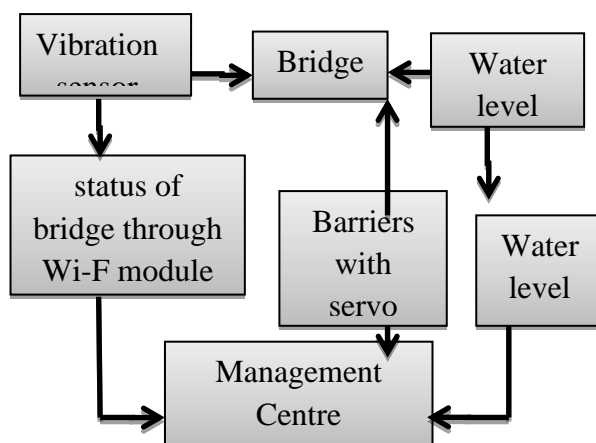


Figure 1. Architecture of Bridge Monitoring System

Manuscript published on 30 June 2019.

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The Monitoring Based Maintenance is used to monitor the status of the bridge in real time. The components that which are used to detect the strain, acceleration, cracks etc. The System includes the desktop application which is useful for the engineers working in the bridge department to display the current position of bridge. There are two important fragments in the system i.e. Vibration Sensor and River water level Transmitter, which sends the details of bridge strength to the Management Center. The entire data will send to the server system. So that as per situation Management Center takes direct action for bridge safety and security. For example if water level increases beyond the defaulting settled water level then security alarm alerts the management center and barriers of bridge will automatically close by management center.

IV. METHODS AND MATERIAL

A. The methodology implemented includes:

1. Structural Design Components
2. WI-FI Module & TCP/IP protocol
3. IoT Components
4. Experimental Setup

1. Structural Design Components

1. Design of Vibration sensor and Water level transmitter which is the Assembly of communicating devices.
2. Water level transmitter senses the water level.
3. Vibration sensor detect the motion of bridge in case of flood.
4. The output value or status is collected on arduino.

2. WI-FI Module & TCP/IP protocol

I. WI-FI module itself act as a server which is connected to the arduino.

II. Through WI-FI module the status or condition of bridge is transmitted to the monitoring Centre.

III. This transmission is done through TCP/IP protocol in the form of packets.

IV. TCP/IP protocol is used to transmit the data without any interruption.

3. IoT Components

The layers of an IoT:

- 1) **Sensor layer:** It detects or collects all kind of necessary information from physical world like physical, credentials, audial, video data.
- 2) **Network layer:** Used to transmit data by like TCP/IP.
- 3) **Application layer:** Application layer used to coordinate the information, share the data and connect monitoring centre and bridge.

4. Experimental Setup

Figure 2 specifies the exact details about the actual setup of the Bridge Monitoring System.

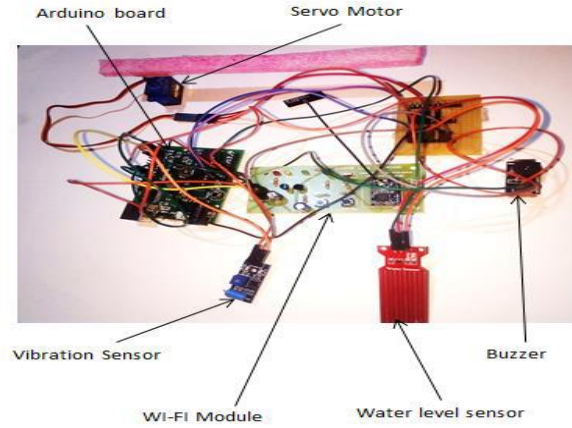


Figure 2. System Setup

B. Material Used:

Hardware required for implementation:

1. **Arduino Board:**
2. **Water Level Sensor:**
3. **Vibration Sensor:**
4. **Servomotor:**

V. CONCLUSION

Bridge health state monitoring in real time has been popular issue. The sensor technology is continuously advance and condition monitoring has never been accurate and easier before. With the help of wireless technology and water level transmitter sensor, smart system is developing for securing bridges. This system checks the water level and the position of bridge for safety purpose. In the emergency conditions like earthquake, flood, etc. the facility of broadcasting the message is added. This System is one of a kind in its capacity to screen the extension condition, it transmits ecological information through remote correspondence and sends cautions to the scaffold the executives staff for example Checking Center continuously for brief activity likewise to user's. The main aim of Bridge Monitoring System is to save the lives of the people, to protect from accident.

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