

Framework design on Bridge Monitor system with IOT Sensor

¹A.Leela Sravanthi, ²M.Sushma, ³Ansa qurratual ain

¹Assistant Professor

^{2,3} Second Year Students

Department of Computer Science & Engineering

Balaji Institute Of Technology & Science, Warangal,Telangana,India

Abstract:-

Now-a-days most of the bridges cross the world build rivers and oceans, which are subjected to maintain it for the life time but at a certain time it is going to expired. Though it is dangerous but they are still in use. Due to rapid occurrence of cyclonic conditions or heavy vehicle loads these bridges may collapsed where the water level is increased and leads to destruction. This may harm the users. So, these bridges required a special care without manual network. So these bridges require a weight sensor, water level point sensor and WIFI module. This system protects from heavy loads ,water level and pressure. If any issue takes place then it generates the signals (alarm) through buzzer with IOT device and auto barriers which is connected to the serve. The achievements have brought a real time monitors systems by using IOT.

Index terms: Wi-Fi Module, IOT, Monitoring Centre

I. INTRODUCTION

Now a day it is very essential to monitor, the bridges [1] in our country or state as there were incidences happen earlier. The reason behind the these incidents as there is no such type 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 [2]. It means that the bridge is not in safe condition. When such situation arises, bridge [3] may be collapse, which causes much kind of losses like accidents, human deaths, etc. This happens because there is no efficient system in existence, which will provide notification about conditions about current condition of bridge [4] when bridge is not in safe mode. In the existing systems, Zig-Bee technology [5] 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.

Therefore in this study, the IOT wireless sensor network [6] and smart building technologies are adopted to solve the various problems of bridge safety information transmission and management by developing an IOT based bridge [7] safety monitoring system capable of monitoring the environmental data of a bridge and transmitting [8] the data to the mobile devices of bridge safety management staff through the router based IOT connection for reference and documentation.

The water level sensor [9] is used through which system has to check manually the level of water. So for this the system is being developed with an real time application[10] in which everything is automated so less human work are required and this application is very much useful For future generations suited for all types of bridges in the emergency condition like prevent from flood, earthquakes. The system developed in this study can help to promote the advancements of bridge safety management [11]. This system aims at developing an application that is useful for the people working at the bridge department or for bridge engineers [12]. 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.

II.SYSTEM ARCHITECTURE:

This system consists of following parts:

1. **Wi-Fi Module** - Through Wi-Fi module the status of the overall bridge will be sent to the monitoring system.
2. **Vibration sensor** – Vibration sensor senses the condition of bridge, whether it is in better condition or not.
3. **Water level Transmitter sensor** – It is used to sense the water level status.
4. **Barriers with servo motor** – If water level increased or the bridge becomes vibrate then barriers with servo motor will close.
5. **Management Centre** – All the necessary information related 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.

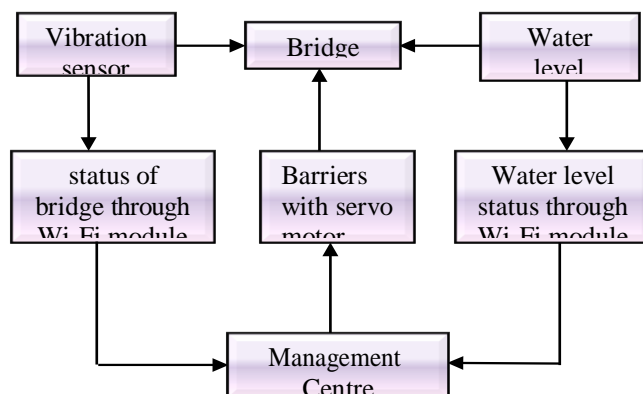


Figure 1. Flow process of bridge monitoring system

It has a technology called MBM (Monitoring Based Maintenance) that enables maintenance engineers to monitor the condition of the bridge in real time. The components that which are used to detect the strain, acceleration, crack etc. The System includes the desktop application which is useful for the engineers working in the bridge department to monitor the current position of bridge.

There are two important chunks in the system i.e. Vibration Sensor and River water level Transmitter, which sends the details of bridge strength to the Management Center. All the collected environmental data sent to the server system. So that as per situation Management Center takes immediate action for bridge safety and security. For example if water level increases beyond the default settled water level then security alarm alerts the management center and barriers of bridge will automatically close by management.

III. 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

1. WI-FI module itself act as a server which is connected to the arduino.
2. Through WI-FI module the status or condition of bridge is transmitted to the monitoring Centre.
3. This transmission is done through TCP/IP protocol in the form of packets.
4. TCP/IP protocol is the transmission control protocol and internet protocol through which the transmission of data is easily possible without any interruption.

3. IOT Components

There are three layers in the architecture of an IOT:

- 1) **Sensor layer:** The sensor layer leads to detect or collect all kind of necessary information from physical world like physical, identification, audio, video data.
- 2) **Network layer:** The network layer mainly responsible for transmitting data reliably and safely through wider and faster networks connections like TCP/IP.
- 3) **Application layer:** Application layer performs the function to support information coordination, sharing and interconnection across monitoring centre and bridge.

IV. Experimental Setup

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

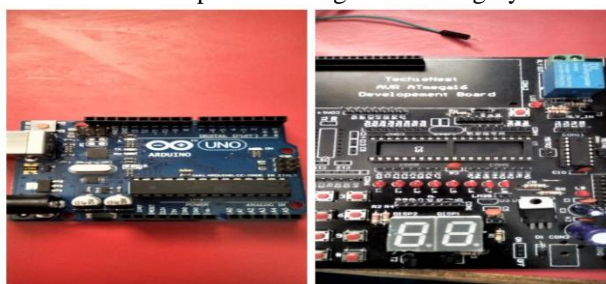


Figure 2. Microcontroller design

B. Material Used:

Hardware required for implementation:

1.Arduino Board:

Arduino Uno is a micro controller board based on the ATmega328 (datasheet, which 6 can be used as PWM outputs). With 14 digital input & output pins along 6 analog inputs. 16 MHz ceramic resonator and universal serial bus connection with a power jack, ICSP header, reset button.

2.Water Level Sensor:

Water Level sensor which is used to detect the levels of substances in the flow. These substances include liquids, granular (sub), powders. The measurements can be used to determine the amount of substances within a closed loop or the flow of water along the bridges.

3.Vibration Sensor:

Vibration sensor used for measuring, display, and analysis of the linear velocity and abstracting, proximity along with acceleration with accuracy steps and levels.

4.Servomotor:

A servomotor is a special device which concerns for precise control of angular or linear position, velocity and acceleration. Consist of a motor coupled sensor for positioning. Servomotor is used in applications such as robotics and various IOT research based on streams in present emerging.

IV.CONCLUSION

Bridge condition monitoring in real time has been a popular issue. The sensor technology is continuously advancing and updating. Condition monitoring has never been accurate and easier before. With the help of wireless technology and IOT water level transmitter sensor, smart system is developing for securing bridges for better assurance for future. 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 unique in its ability to monitor the bridge environment, it transmits environmental data through wireless communication and sends alerts to the bridge management staff i.e. Monitoring Centre in real time for prompt action also to user's. The main aim of Bridge Monitoring System is to save the lives of the people, to protect from accident.

V. REFERENCES

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AUTHORS BIOGRAPHY:



A. Leela Sravanthi Asst. Professor, Balaji Institute Of Technology & Science Narsampet, Dept. CSE.
Email id: sravanthi.aeruva28@gmail.com.



Mogulagoni Sushma pursuing B.Tech, Balaji Institute Of Technology & Science Narsampet, Dept CSE interested in IOT & Web Technology.
Email id: sushma.mogulagoni@gmail.com.



Ansa qurratual ain pursuing B.Tech, Balaji Institute Of Technology & Science Narsampet, Dept. CSE interested in CLOUD COMPUTING.
Email id: zaishanoor61488@gmail.com.

