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IOT Based Highway Bridge Safety Monitoring

Riya R. Matade [1], Vaishnavi R. Takale[1], Tanuja N. Vadage[1], Ms.Sonali B. Patil[2]

[1]UG student,Dept. Electrical Engg, SIT Polytechnic, Yadrav (Ich.)

[2] Lecturer ,Dept. Electrical Engg, SIT Polytechnic, Yadrav (Ich.)

ABSTRACT

A bridge monitoring system is a significant to the structure health monitoring of both old new bridges and fly over infrastructure daily used by citizens of their respective Countries . the following reports is proposed and developed architecture for the bridge monitoring on a more secure level taking into consideration the Various parameters that are involved in the structural health of bridges. Of 3- level distributed structure is adopted in the Monitoring system , which include a central Server , intelligent acquisition Node, and Local controller . Acquisition Nodes are Located Across the Bridge. One local Controller Manages all the acquisition Node. Every Acquisition Node has 8 Channels, Which can easily & Approximately Sample TheDeviation of the Line of the Sight , the Vibration of the bridge due to a load of Various transport &as well the Water level which when cross a threshold lead to a flood . To get high precision data , 10 bits A/D Converter is being used . Compared to the Traditional Method, The proposed Architecture has to Features . The acquisition Node is a Smart Device based on a powerful Controller . Signals Of Field Sensors are analyzes & real –time compressed in the acquisition node

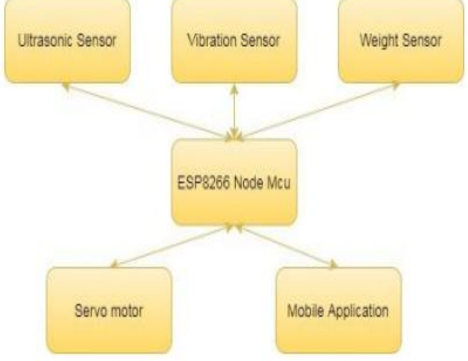
Keywords— Bridge safety , Monitoring ,Flood conditions, Emergency ,IOT, Data Analysis.

INTRODUCTION

This system detects a load of vehicle (high aptitude vibrations), water level, and deviation form the line of the sight . If any of the Water level, Water Pressure ,vehicle load on the bridge &the line of sight deviates from its threshold value then it generates the alert through buzzer & auto barrier at present, there have been various system

In this system existing system Blynk technology was used when it cost consuming quite time consuming , but this system used in TCP/IP protocol when it is Suited for all types of bridges

In this study of IOT wireless sensor Network & Smart sensor network & smart building technologies adopted Solve to the various problems of bridge safety transmission information also management developing by the IOT based bridge safety monitoring system capable to environmental motoring data of bridge &data transmitting to mobile devices for bridge



SYSTEM ARCHITECTURE

This System consists of following system

- Wi-Fi Module –The Wi-Fi module of the overall bridge will sent to the motoring system
- Vibration sensor – vibration sensor senses to condition of bridge ,whether it in better condition or not.
- Ultrasonic sensor- It used to sense the WIFI status.
- Barriers with servo motor- The water level increased or bridge becomes vibrate the bridge becomes more then default value barriers then with servo motor will close.
- Management Centre – All necessary related information to status of bridge is to send to an monitor by management .
- HX711 Weight Sensor- It used to measure the current weight to the bridge.

Fig 1 shows the data share between bridge & monitoring centre is take places with WI-FI module itself as act like server which through the status of condition of bridge is transmitted to that monitoring centre. The monitoring devices such as weight sensor & continuously monitoring structural health bridge if water level increased or weight too much high &bridge being to vibrated barriers with the servomotor will close at the same time ,status of the bridge condition directed to monitoring Centre.

Bridge safety Monitoring System using

IOT Components

There are three various different architecture of an IOT

- Sensor Layer :

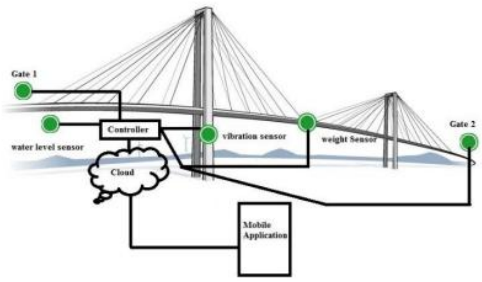


Fig 1.Architecture of Bridge Monitoring system.

It has a technology called has a MBN (Monitoring Based Maintenance) enables the maintenance engineers to the monitor condition of the bridge his in the real time The components which is used in the detect the strain , acceleration ,cracks etc The system is include the desktop application which is the useful to the engineers working in the bridge department to the monitor to a current position of the bridge.

There are three various chunks in the system i.e Vibration sensor ,Weight sensor & River water level sensor, which sends the details of the bridge to the Management Centre(12) All the collected environment data sent to server system that as per Management situation centre takes action immediate for bridge security & safety If water level increases beyond the default then the water level system alerts the management centre& barriers bridge will automatically close by management centre.

III METHODS AND MATERIAL

The implemented methodology includes;

1 Structural Design components

2 WI-FI Module & TCP/IP protocol

3 IOT components

4 Experimental setup

Structural Design Components

1 Design of Vibration sensor , weight and Water level sensor is assembly to communication devices.

2 Ultrasonic sensor senses the water level.

3 vibration sensor is detect the motion of bridge in the case of heavy wind & environmental parameters

4 weight sensor detect load of the bridge.

5 The value of the output status collected on ESP826

1)The slayer of the sensor leads to the detect through collect all kind of the necessary information from physical like world physical, identification ,audio, video data.

2) Network layer :

The network mainly layer responsible to the transmitting data reliably & safely through a wider faster networks connections like TCP/TP

3) Application Layer:

The application layer performs the support function information sharing the interconnection monitoring across the centre of the bridge.

4) Experimental Setup : figure about the actual of the Bridge Monitoring system.

Material Used:

Hardware required to the implementation is

1.ESP8266 Node MCU

The ESP8266 is a microcontroller which have the In built WIFI module to connect device through the internet.ESP8266 have an 1 analog pin & 11 data pins to connects many pins in the single phase.

- Water level Sensor: Ultrasonic sensor is the sensor which detect the level of the substance such as a liquids ,slurries , granular material & powders This measure the amount of the materials within through closed container or flow of water in open channels.
- Vibration sensor :Vibration sensor is the sensor to measuring a displaying the analyzing , displacement velocity ,weight, acceleration.
- Weight sensor: The amplifier Module HX711 load cell is used 24 high precision ADC chip converter chip hx711 is for electronic scale &style two analog input interior programmable gain amplifier integrated with multiplier 128.HX711 two wire interface(Data & clock)for communication

- Servomotor

A servomotor is a simple controlled with the assistance of the servomechanism to servo mechanism motor controlled the DC mechanism motor it is commonly used to referred a FC servo Motor .It used to operate the motor controlled as a AC servo Motor.

RESULT

Fig 4. Notification receive

The fig shows the result regarding through the safety bridge & helps us to monitor also maintain the condition of the bridges in the water Bodies

CONCLUSION

Bridge health condition monitoring in a real time very popular issue sensor technology is continuously condition monitoring never be accurate before help of the wireless technology also water level sensor , smart system developing to securing bridges. This checks the water level position of the bridge for the safety purpose . In emergency condition like earthquake , flood The system is unique its ability to the monitor bridge environment transmits the environmental data such as wireless communication alerts the bridge staff management

REFERENCES

1. Jin-Lian Lee, Yaw-Yauan Tyan, Ming-Hui Wen, Yun-Wu Wu "Development of an IoT-based Bridge Safety Monitoring System" Proceedings of the 2017 IEEE International Conference on Applied System Innovation IEEE-ICASI 2017.
2. Y. Sun, "Research on the Railroad Bridge Monitoring Platform Based on the Internet of Things," International Journal of Control and Automation, vol. 7, no. 1, pp. 401–408, 2014.
3. A.Praba Asst. Prof., Civil Engineering Department, VCET, Madurai, India "IoT of Civil
4. Infrastructures, International Journal of Research in Advanced Technology-IJORAT Vol. 1, Issue 6, JUNE 2016 .
5. Chae, M. J., Yoo, H. S., Kim, J. R., Cho, M. Y. "Bridge Condition Monitoring System Using Wireless Network (Cdma And Zigbee)" ISARC, 2006 .
6. M. T. Lazarescu, “Design of a WSN Platform for Long-Term Environmental Monitoring for IoT Applications," in IEEE Journal on Emerging and Selected Topics in Circuits and Systems, vol.3, No.1, March 2013, pp.45-54.
7. P. Daponte, F. Lamonaca, F. Picariello, L. De Vito, G. Mazzilli, I. Tudosa, "A Survey of Measurement Applications Based on IoT," 2018 Workshop on Metrology for Industry 4.0 and IoT, Brescia, 2018, pp.1-6.
8. E. Balestrieri, L. De Vito, F. Lamonaca, F. Picariello, S.Rapuano, I.Tudosa, “Research challenges in measurement for Internet of Things systems," ACTA IMEKO, vol.7, No.4, Dec. 2018, pp.82-94
. 9. P. Daponte, L. De Vito, F. Picariello, S. Rapuano, I. Tudosav, “Wireless sensor network for traffic safety”, in Proc. of IEEE Int. Workshop on Environmental, Energy and Structural Monitoring System - EESMS2012, 28-28 September 2012 Perugia, Italy, pp.42-49.10. Balamurugan A., Purusothaman T., “IPSD: New coverage preserving and connectivity maintenance scheme for improving lifetime of wireless sensor networks”, in WSEAS Transactions on Communications, 2012, Vol.
11, Issue 1, Pg 26-36 11. P. Daponte, L. De Vito, S. Rapuano, M. Riccio, I. Tudosa, “Wireless sensor network for traffic safety: analysis of measurement uncertainties," in Proc. of IEEE Int. Conf. and Exposition on Electrical and Power Engineering - EPE2012, 25- 27 October 2012 Iasi, Romania, pp.882887.
12. P. Daponte, L. De Vito, G. Mazzilli, S. Rapuano, I. Tudosa, “Network design and characterization of a Wireless Active Guardrail System”, in Proc. of Int. Instr. and Meas. Technology Conference - I2MTC2014, 12-15 May 2014, Montevideo, Uruguay, pp.1047-1052.