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Bridge Health Observation System

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Abstract - *We have proposed structural health Observation system for bridges. This technique offers a less expensive alternative to the present high cost wired network with high maintenance. It permits users to monitor the health of bridge in real time. In Asian nations new bridges are build every year. The upkeep of those bridges now and then gets neglected. This project conjointly states the necessity of bridge health Observation system so as to secure structural and operational safety and issue early warnings on damage or deterioration before costly repair or maybe catastrophic collapse.*

Key Words: **Bridge health Observation system. Accelerometer, Signal Conditioner, Ultrasonic Sensor, Microcontroller.**

1. INTRODUCTION

There is steady decline of sturdiness when any bridge is formed because of loading and environmental impacts. The sturdiness of bridge depends on strength of its elements like columns, beams, etc. If the strength of those elements decreases beyond a particular limit it might result into damage. Once this limit is reached, damage within the materials happens, and its load-bearing capacity is reduced permanently, considerably and quickly. In a very well-designed system, a localized failure shouldn't cause immediate or maybe progressive collapse of the complete structure. Final failure strength is one of the limit states that has got to be accounted for in structural engineering and structural design. To avoid collapse/ accident, localized damage ought to be detected timely for taking applicable measures.

We have developed a system for structural health observation of bridges named as "Bridge Health Observation System" and this system is used to monitor the health of bridges in real time. This method will help us cut back the money spend on pricey repair of bridges.

As the traditional technique of monitoring the health of bridges, We'd like to physically go and examine the health of bridges.

Inspection of bridges is a very tedious process and also may sometimes lead into errors because of manual inspections.

Looking on all the above given conditions, we've build a system which will facilitate them to cut back their efforts.

2. PROBLEM DEFINATION

Bridges in India are critical in several regions because of their use for many decades. We are developing such a kind of system which will permit the inspection of these bridges in real time. The importance of developing sturdy observation systems that may notice and find progressive deterioration in structures or abrupt damage induced by extreme loading events or environmental impacts is well recognized. The most commonly approach for bridge monitoring is periodic visual inspections. Needless to say, this approach is restricted to deterioration or damage that is not hidden from view and it can be expensive. In these forms of inspection, we cannot give information on the overall health of the structural system therefore to beat this disadvantage we are developing such kind of system.

3. LITREATURE SURVEY

Some failures are sudden and ruinous, and few failures just take their time. Structural Health Observation (SHO) can be very helpful in serving as an alarm device for preventing both types of failures. Bridge Engineers want scientific tools which can give fast data about the health of a bridge. Such instrument shall supplement the periodical manual inspections. However once failures happen with any kind of structure there's loss of human lives, money and a lot more, most of the times. For example, during the bridge construction boom of the 1950's and 1960's, little emphasis was placed on safety inspection and maintenance of bridges. This changed when the 2,235 foot Silver Bridge at Point Pleasant, WV, collapsed into the Ohio River, on Dec. 15, 1967. 46 people were killed.

Hence to ensure the safety of bridges, the Bridge Health Observation System was introduced. Some of the existing technologies/methods for Bridge Health Observation System are as described.

4. Basic Overview

This Project is based on 2 sensors:

- Accelerometer
- Ultrasonic Sensor

The micro-controller we have used is "PIC16F877A". We've used LCD display to show the 2 parameters perpetually. We have used a Max 232 IC to perpetually send the parameters to the management / Observation station.

We are going to use a computer as a management / Observation station where we have used Visual Basics 6.0 to displaythe parameters.

4.1 Block Diagram

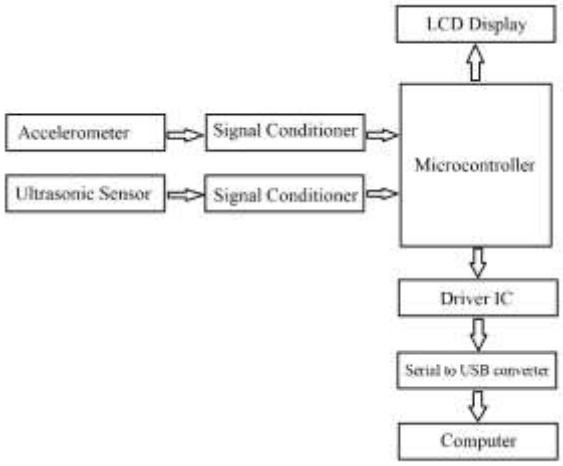

Fig -1: Block Diagram

4.2 Block Diagram Description

The 2 sensors used in the block diagram particularly Accelerometer and Ultrasonic Sensor. The accelerometer is used to detect the bridge tilt. It senses the motion of the bridge in 3-axis. We are going to connect the accelerometer at the center of the bridge. Then the Ultrasonic sensor can measure the water level below the bridge.

These pair of sensors are interfaced to the microcontroller through a signal conditioning circuit. The signal conditioning circuit is used to make the outputs of sensors compatible with microcontroller.

The LCD is used to display the parameters perpetually. All the parameters are constantly transmitted to the Observation station nearby.

The PIC reads the output from sensors using "A to D" conversion, displays on liquid crystal display. The microcontroller sends this information to remote display unit in concerned office. The remote display unit receives the info and displays on the liquid crystal display.

5. Advantages

- Early damage detection.
- Cut back the operation prices of inspections and maintenance.
- Improved lifespan prediction models.
- Improved management and maintenance strategies for higher allocation of resources.
- Previous notice of any faults.

6. Disadvantages

- Main disadvantage is that the sensors mustn't fail when there is an adverse condition.

7. FUTURE SCOPE

Wide accessibility of affordable sensors being used in structural health Observation systems, growing infrastructural development across the world, increasing awareness of governments towards the upkeep of heritage structure so as to spice up the tourism revenue of their country, government laws to cut back the loss of lives through regular maintenance of public infrastructure are the main factors driving the structural health Observation systems across the world. Use of SHO systems throughout the development of an infrastructure can facilitate in distinctive the inadequacy in its construction and design, new government laws towards the mandatory implementation of SHO systems so as to cut back loss of lives.

In standard SHO systems, information is collected manually through implementing of sensors on the infrastructure, currently the hi-tech systems consist automation systems that reduces the price of maintenance. Non-destructive monitoring, non-contact vibration measurement systems are some new trends improving the SHO accuracy. Cost-reduction because of the technological advancement of the SHO systems is anticipated to be the key issue driving the SHO market over the forecast period i.e. 2021-2025. High-cost, inaccuracies within measurement, lack of experience, alternate strategies of Observation are some factors restraining the expansion of SHO systems over the globe.

8. RESULTS ACHIEVED

These are the result achieved in our project:

8.1 Column 1 is OK

This shows column 1 of bridge is OK.

Fig -2: Column 1 OK

8.2 Column 2 is OK

This shows column 2 of bridge is OK.

Fig -3: Column 2 OK

8.3 Column 1 is Not OK

This shows column 1 of bridge is Not OK.

Fig -4: Column 1 Not OK

8.4 Column 2 is Not OK

This shows column 2 of bridge is Not OK

Fig -5: Column 2 Not OK

8.5 Flood Level Reached

This shows that water level has reached its threshold limit.

Fig -6: Flood Level Reached

9. CONCLUSION

Thus, we have developed a bridge health Observation system using a sensor network. The system uses a sensor network for information assortment and act as a link between the bridge and management center. The obtained results were matched with acceptable error and that did not change the status of the bridge. This planed system is less expensive and simple to use compared with alternatives to similar systems. AS a result, with the help of bridge health Observation system we can detect numerous upcoming issues in bridge and solve it before any disaster happens.

10. REFERENCES

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