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Bridge Condition Monitoring System and Boat Height Prediction

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Abstract: Wireless network is used in this project on real time basis for bridge health observing purpose. Data can be transmitted continuously for several minutes. Detection of vibrations, cracks & sand level at the base occurs. Till now bridge inspection is done manually each time and it takes a lot of time to detect the fault. An experienced man is required for inspection of the bridge properly. All the observations are done visually. It means a man with all the technical knowledge is responsible to detect and measure the cracks in the field. After all this we need to implement the correction process for any crack, sand level of the bridge, which is a difficult task. During rainy season it becomes more difficult. The methodology that is proposed in this project should be tested, types of experiment were done in limited environment and the outcome were matched with rest of the methods. Adding to this experiment with structures in reality were conducted. Our proposed project research is focusing on implementation of system having sensors. Techniques which uses GSM is used to inform bridge condition to the officers present nearby. In the railway bridge health identification is important and is can be done through bridge observation system. A newly architecture for large span bridge monitoring is proposed and developed in this paper. The observing system adopts 3 level distributed structure which has central server, intelligent acquisition node and local controller. Acquisition nodes are placed all over the bridge. One native controller manages all acquisition nodes. Eight channels are present in each acquisition nodes in which displacement, acceleration and strain of bridge is sampled. A 10-bit A/D converter to get high precised data. When the normal methodology is compared, it is found that the architecture which was proposed has two features. First one, the acquisition node based on the powerful DSP processor is a smart device. The analysis of signals from field sensor are done and the acquisition node compresses it within itself in real time.the result which are processed are sent to

surrounding controller through IEEE802.11 network which is wireless. The load on the central server is reduced and demand of communication bandwidth can be decreased by this operation. Second one, between local controller and central server 2G wireless network is used to make available enough bandwidth for transmission of real time data. For six months, in an oversized span railway bridges intelligent observation system has run. As a result, the system which was projected is stable and efficient.

Keywords-Sensors, height, boat, MATLAB, bridge

I. INTRODUCTION

The health condition of railway and highway bridges system are decisive in many realms and it has been used from several decades. It is necessary to have a system to observe the health of those bridges and to report once and wherever maintenance is required. Development in the sensing element technology have brought the machine-controlled bridge health monitoring system. In this project, the safety monitoring System that we have used is based on IOT.This system has developed using ZigBee technology. Digital image processing has used to avoid the boat collision by predicting the boat height. The communication between boat and the bridge is developed using ZigBee. RF module has used for short distance communication.GSM module is used for long distance for data communication.

This technology is also known as Monitoring based Maintenance. It allows the bridge maintenance engineers to monitor the condition of bridge in sufficient time. The sensor which has installed in the system measures the various parameter in bridge, bend, beam sustainability, weight of the vehicle etc. At any time if any of these parameter reached to their threshold value the communication system informs to the management center by giving the alarm to take the precautional steps.An ARM processor is used to collect all the parameter from the bridge with the help of devices.Here the communication is stablished by RF module which uses wireless Transmitter and receiver circuits.The transmitter send all the parameter to receiver and sends a message with all the parameter to a database centre.The GSM techonology is used to established between the intermediate module and database centre.

II. LITERATURE REVIEW

[1] In this proposed paper the ultrasonic gauge and radar gauge have been adopted to replace the float gauge and pressure gauge in previous equipment. However, the water level warning system ought to be ready to have stability, high resolution, and low cost. Hence, this paper presents the planning of an image straight forward system, that contains a water level sensing element incorporated with a floating body and a load cell to produce an accurate water level management system.

[2] In this paper, water recognition and the surface velocity recognition are two types of the real time (sufficient time) water observing by the use of image processing technology. Floods within the stream usually cause great risk to bridges as per the bridge failure investigation, and the structure can collapse due to scouring. Within the field its very important to develop the bridge observation technique for bridge safety. The water level and surface velocity images are captured by the two high resolution cameras which are installed around the bridge site. The image binarization, character recognition and water line detection are also used. The disparity of water level and surface rate for 3 days is recorded and measured by planned system. Throughout the flood duration the information of water level and surface rate is produced through the potential planned system and the results are good.

[3] In the analysis of this paper, bridge safety observing system is evolved based on IOT by using ZigBee technology. The system compromises of: 1) bridge monitoring devices and cloud-based server are connected using communication devices. 2) a dynamic information source where bridge condition is stored. 3) A server which is cloud based is present which calculates and examine data conveyed from observing devices. The monitoring and examining of the conditions, its atmosphere, pipelines, air by this system used. The mobile telecommunication devices are used to posses the information data of the bridge health and detect information and images.

[4]In this paper we have reflect that how to monitor the level of water in water system like rivers,ponds using remote .It also monitor the floods area wireslessly and information can sent to mobile without using any wire.The meant of this project is to observe the water level with the help of water level sensors ,GSM ,ZigBee 802.15.4 and 74HC14 inverter technology.Further the quality of water is monitored with the help of water quality sensing element such

as turbidity sensors and dissolved oxygen sensors. The water level, dissolved oxygen, turbidity, temperature and PH level of the water is monitored by sensors. The water flow and home power consumption can be reduced using this approach.

[5]This paper is refer to problem of measurement of height of a tree using image processing through three points correction.In conventional method were used two points maker one was the set on the root of the tree and other was set one meter height from the root.The gouge was wonted the camera to take the images of the tree and also the image which had created perpendicular to ground. This method has many restrictions practically. In this paper we have used three maker points and in a line along the tree trunk with an equal distance. After that the top point of the tree and the co-ordinates of the three maker points have extracted in uniform to their color features. In this method the image is corrected by three maker points. Using triangle similarity theorem, the height of the tree is determined. The relative error measures of the height of the tree by this method is insignificant as compare to standard method.

[6] As time passes the strength of the bridge reduced in many aspects. It also dangerous for human life. With the help of Overpasses traffic delay can be reduced. In recent year to develop the SHM platforms for bridges wireless sensors technologies have been used. The finite lifetime of batteries and the high price of battery replacement creates a limitation and make such system as prohibited because of price in many ways. Using electromagnetic generator harvests vibrations in bridge created by passing traffic that is converted in operational electrical energy. Electromagnetic generator provides the power up to 12.5 mW in resonant mode with the frequency 3. 1Hz.The trinket of the system with includes the strong integration of the power generator and a sensible algorithm for energy conversion that transfer between low power mode and impedance matching mode. Finally, the result of the field experiment is representing that the harvested energy of vibration on a ruler bridge is converted into usable electrical energy which utilize in the system which is used and also the traffic is reduced.

[7] The bridges and flyover are used every day by people of their countries. A bridge health observing system is very important for each old and new bridges. A more secured system is developed and a newly architecture for large span bridge monitoring is proposed and developed in this paper. The observing system adopts 3 level distributed structure which has central server, intelligent acquisition node and local controller. Acquisition nodes are placed all over the bridge. One native controller manages all acquisition nodes. Eight channels are present in each acquisition nodes in which displacement, acceleration and strain of bridge is sampled. A 10-bit A/D converter to get high precised data. When the normal methodology is compared, it is found that the architecture which was proposed has two features. First one, the acquisition node based on the powerful DSP processor is a smart device. The analysis of signals from field sensor are done and the acquisition node compresses it within itself in real time. The result which are procced are sent to surrounding controller through IEEE802.11 network which is wireless. The load on the central server is reduced and demand of communication bandwidth is can be decreased by this operation. Second one, between local controller and central server 2G wireless network is used to make available enough bandwidth for transmission of real time data. For six months, in an oversized span railway bridges intelligent observation system has run. As a result, the system which was projected is stable and effective.

[8] This project system uses wireless network on real time basis for bridge health monitoring purpose. It can transmit the data continuously for several minutes. Currently Bridge Inspection is done by manually each time and also takes lots of time to find & detect any fault. Our proposed project is focusing of implementation of system having sensors, Zigbee technique which informs bridge condition. Height of the boat is detected, recorded and transmitted for crash avoidance.

[9] This project system uses wireless network on real time basis for bridge health monitoring purpose. It can transmit the data continuously for several minutes. In that detection of ‘vibrations’, ‘crack’ & ‘sand level at the base’ occurred. Currently Bridge Inspection is done by manually each time and also takes lots of time to find & detect any fault. It requires specialized or experienced man for inspection of bridge. They have to monitor the condition of bridge by visual inspection thoroughly. a man with all the technical knowledge is responsible to detect and measure the cracks in the field. Then implementi.ng the correction process for any crack, sand level of the bridge is difficult. Also, the more attention required at the time of rainy season. The methodology that is proposed in this paper should be tested, types of experiment were done in limited environment and the outcome were matched with rest of the methods. Adding to these experiments with structures in reality were conducted. Our proposed project research is focusing of implementation of

system having sensors, Techniques which uses GSM is used to inform bridge condition to the officers present nearby. This advance technique using GSM is very helpful to human and nation also. Keywords: PIC Microcontroller, MAX232 IC, GSM model, Vibration Sensor (ADXL335), LCD.

[10] The man-made ocular detection and identification of the bridges, cracks cause dangers. Therefore, here we keep an advanced method of digital and intelligent, well informed identification system which detect the fractures in the bridges, along with machine vision and Deep belief network technologies. Here GPRS /3G or wired network is used to collect and pre-process image to transmit image data to perform image analysis it uses high level image servers. This method is very helpful to detect the cracks in the bridges. It also improves the best processing algorithm. Deep Belief network is used to classify the cracks in the bridges. Experimental analysis shows that this system is able detect all type of cracks beyond the maximum value. It can also effectively identify the types of fractures. The identification rate is above 90%. This fulfil the accuracy requirements of engineering.

[11] For the bridges and flyover bridge monitoring system is very helpful in terms of diagnosis. For the large bridges this report is projected and completely developed in a special way. A more secured system is developed and a newly architecture for large span bridge monitoring is proposed and developed in this paper. The observing system adopts 3 level distributed structure which has central server, intelligent acquisition node and local controller. Acquisition nodes are placed all over the bridge. One of the local controllers manages all acquisition nodes. Eight channels are present in each acquisition nodes in which displacement, acceleration and strain of bridge is sampled. A 10-bit A/D converter to get high précised data. When the normal methodology is compared, it is found that the architecture which was proposed has two features. First one, the acquisition node based on the powerful DSP processor is a smart device. The analysis of signals from field sensor are done and the acquisition node compresses it within itself in real time. The result which are processed are sent to surrounding controller through IEEE802.11 network which is wireless. The load on the central server is reduced and demand of communication bandwidth is can be decreased by this operation. Second one, between local controller and central server 2G wireless network is used to make available enough bandwidth for transmission of real time data. For six months, in an oversized span railway bridges intelligent observation system has run. As a result, the system which was projected is stable and effective.

[12] Now days many developing countries one of them is India is focusing strongly on their national infrastructure. Almost every year new bridges build. Many times, the maintenance of these bridges has overlooked. The existing system consist of high price wired network which creates difficulty to use. The optical fiber which has used in this network has high maintenance cost. So, the our main prospective is that to create a low-cost bridge health monitoring system for developing countries.

[13] Particularly, in this paper Stream Processing and Artificial Neural Network Techniques (SPAN Net) is used to develop and set out an improved version of structural health monitoring system. Based upon the calculated bending strain, wireless sensing element network, data stream processing and artificial neural network is applied by SPAN Net. The major outcome of this paper was the damage detection of engineering structure and a much effective, errorless and energy aware data communication, on site levels, test bed, computer-based simulation is used to test and evaluate the SPAN Net. During normal operation, the maximum observed values are 25 to 30 macrostrains as per the measurement. We can rely on 90% of data communication by the given protocol. SPAN Net is as much efficient of real time data, observing and indication, which confirms efficiently the threshold which is predefined which can be changed as per the user requirements and structural engineering features.

[14] Many of the bridges that has made over the river is still in use but their structural health has already devolved. The life-time of these types of bridges have expired. This is dangerous for the people those are using these types of bridges. This type of bridged may get collapse due to heavy rains, heavy loaded vehicle, high water level pressure on the bridges. These types of bridges needed continuous monitoring system. Therefore, we are proposing a system that monitor all the parameter like weight using load sensor, bending in the bridge using flex sensor, water level using water level sensing element, and pressure using pressure sensor etc. Along with these the system consists of Wi-Fi module Arduino microcontroller. If the sensing element crosses the threshold value then it generates the alert through buzzer and auto barrier. The keyword is IOT, Bridge Monitoring, Alert Generation.

[15] It is a challenge to monitor the damages of the bridges for the benefit of public. It is concern to make

sure that the condition of the civil infrastructure bridge is able of resist cumulative weight of the vehicles that Cross the bridge. In this framework, the ZigBee protocol is used for monitoring the bridges damages that exist in civil infrastructure these damages are identified by using three types of sensors namely flex load cell and vibration sensor. this is used to identify the damages in the bridge using ATMEL89C51 microcontroller. The changes of the sensing values will be displayed in the LCD. the ZigBee is used to control and monitor the sensors and then the detected values passed to the IC. Then the ZigBee transceiver will pass the signal to ZigBee receiver by using the antenna.

III. COMPARATIVE ANALYSIS

AUTHOR	METHODOLOGY	RESULTS	OBSERVATION
Sheng-wei wang and all	water level sensor incorporated with a load cell and a floating body to provide an accurate water level measurement system.	The water level warning system has stability, high resolution and low cost.	it provides an accurate water level measurement system.
Divya muddala and all	A 3-level distributed structure is adopted in the monitoring system.	It can relieve the load of a central server. The system run on a large a span bridge.	The system is stable and effective.
Franco Lin and all	The image processing technology and Particle Image Velocimetry.	the planned systems have potential to produce real-time data of water level and surface rate through	proposed systems are used to record and measure the variations of the water level and surface rate for an amount of three days.

		out flood periods.	
Maheshwar Reddy and all.	Wireless network on real time basis for bridge health observance purpose. ZigBee technique informs bridge condition.	Height of the boat is detected, recorded and transmitted for crash avoidance.	It can transmit the data continuously for several minutes.
Saima Maqbool	Water level sensors, ZigBee 802.15.4, 74ch14 inverter and GSM technology.	It will monitor the quality of water.	Helps in reducing the water overflow and home power consumption.
Dianyuan han	Image processing technique and triangle similarity theory.	The relative measuring error of tree height is far smaller than the standard method.	The tree was extracted consistent with their color features, the image was corrected by 3 marker points.

IV. PROBLEM STATEMENT:

To predict the height of the boat and rate of flow of water level.

To monitor the condition of the bridge.

V. CONCLUSION

This project presents a prototype of a system for applications of structural health monitoring of bridges.

Conducted theoretical analysis facilitates selection of a natural frequency with the highest energy content and quick estimation of parameters for an electromagnetic harvester.
Field test sensor show the feasibility of the proposed approach for applications of structural health monitoring.
The boat height is predicted to avoid the collision between the boat and the bridge.
This system is special in its ability to observe the structure environment, transmit the sensor data through wireless communication and sends alerts to the concerned authority in real time for prompt reactions.
This system can enable 24X7 monitoring as well as appropriate response in emergency conditions.

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