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IOT-BASED MONITORING SYSTEM FOR ENHANCED BRIDGE SAFETY

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ABSTRACT: A fully automated system for monitoring the health of bridges in real-time is now within reach, all thanks to developments in sensor technology.Several long-span bridges in Japan and Korea have already installed this real-time health monitoring system. An new concept, this way of evaluating a bridge's condition. The evaluation of short-range data transfer, particularly between bridge sensors, is done in TCP/IP wireless networks. However, data can be sent from the bridge to the control center across long distances using CDMA wireless networks. (1) The bridge is close to where the monitoring equipment for this system is located. 2) Hardware that allows the bridge tracking system to talk to the server in the cloud. (3) A dynamic database is used to store data related to bridge conditions. (4) A storage and processing platform for data collected from various monitoring devices that is accessible online and stored in the cloud. Important safety parameters including air quality, water levels, and utility condition can be tracked in real-time using this method, as can the bridge's surroundings. The bridge's condition may be tracked in real-time by users using their mobile devices, which then send the data and photographs to a server and database.

KEYWORDS **-** internet of things (iot), bridge safety monitoring system, data analysis

1.INTRODUCTION

New developments in information technology have helped the Internet of Things grow and spread. This substance is very porous, has many effects, and offers many total benefits. This improvement makes the Internet of Things (IoT) tools that structural engineers use better. Structures that are unstable, connected, and complicated may be able to grow with its help. Concerns about the safety of bridges are mostly caused by cracks. Studies in the past have shown that fractures are a major safety risk, as they are involved in almost 90% of bridge-related accidents. The decision that 0.3 mm is the widest a bridge fracture can get was based on a lot of theory research and technically advanced work.If the weight goes over the allowed limit, the bridge's structure will weaken and it's more likely to fall. Spreading up-to-date information at the right time is therefore very important to avoid building disasters and find problems with bridge construction.

This article looks at how the Internet of Things (IoT) can be used to keep an eye on the health of bridges, with a focus on finding cracks in the structures. With the help of Internet of Things (IoT) technology, the system can find cracks in real time and take into account the special needs of bridge building.

2.RELATED WORKS

New developments in information technology have made it possible for the Internet of Things to come about. This substance is very porous, has many effects, and offers many total benefits. This improvement makes the Internet of Things (IoT) tools that structural engineers use better. As a result, complex, interdependent structures are urged to grow. Concerns about the safety of bridges are mostly caused by cracks. Studies of the past have shown that crack-related accidents make up almost 90% of all bridge disasters. A lot of research and scientific know-how went into figuring out that the biggest crack that can form in a bridge is 0.3 mm.

If you go over the allowed width, you could damage the bridge's construction and cause it to fall down. Spreading up-to-date information at the right time is therefore very important to avoid building disasters and find problems with bridge construction.It's normal for people to forget to turn off the pump or faucet when they fill up the container. After that, the water can flow and go away. We think that the idea of the "Internet of Things" could help solve the problem. An ESP8266 sensor is used in our setup to keep an eye on the water level in the container. The sensor can automatically open and close the pump or valve to cut down on water waste and overflow. Ultrasonic monitors are used to find out how much water is in the tank. To keep an eye on and change water amounts, our system uses PHP web programming along with the Blynk Internet of Things solution. The test of the device was done in a 64-centimeter-diameter water barrel. We can change the water level by two centimeters with this method.

There are more and more Chinese people living in town who get around by car and motorbike. There are more ship-bridge crashes now because there are more types of bridges, ships are getting bigger, and navigational speeds are going faster. For the bridge-waters area, a ship safety navigation device was to be made. Embedded systems, predictive control technologies, wireless networks, and global positioning systems (GPS) would all work together in this system to help the ship find its own way and give navigational directions. After looking around the deck and the area around it for anything that could be dangerous to the ship, this choice would be made. With this method, things can get better and disasters can be avoided.

3.SYSTEM MODEL

At the moment, someone has to check the bridge's safety features every day. This makes it harder to make sure that safety standards are always being met. An check that needs a complicated system and a lot of hard work is needed to make sure the bridge is safe. So, mistakes made by people could be a reason why accidents and disasters happen more often. The way things are done now comes with care costs.

4.WORKING METHODOLOGY

As suggested, the suggested answer makes it easier to keep an eye on and control people's safety. With the help of data and the Internet of Things (IoT), the current safety of the bridge can be found. Any necessary steps can then be taken. The Wireless Sensor Network (WSN) technology used in this study is used to build an Internet of Things-based bridge safety tracking system. New developments in sensor technology have made it possible to handle bridge maintenance and check on them in real time. This will help when it comes to dealing with shocks and floods. The goal is to lower the number of terrible events that happen so that lives are saved. By sending certain data to the computer and database, users can keep an eye on health problems from afar.

Adding technology to the system could be a good option. It is possible to both make educated guesses about the bridge's state and make sure that someone responds quickly. Using tools that correctly measure the river's water level can help keep disasters from happening. Because wireless transfer networks are being used, the speed is much faster. Since everything is automatic, mistakes made by people are much less likely to happen. The system is built around an ARDUINO UNO (ATmega328P) microcontroller that saves the whole program. A tool like the one in Figure 1 can be used to keep an eye on the river's level and flow. There is a warning next to the bridge, and a servo motor holds up a barrier.

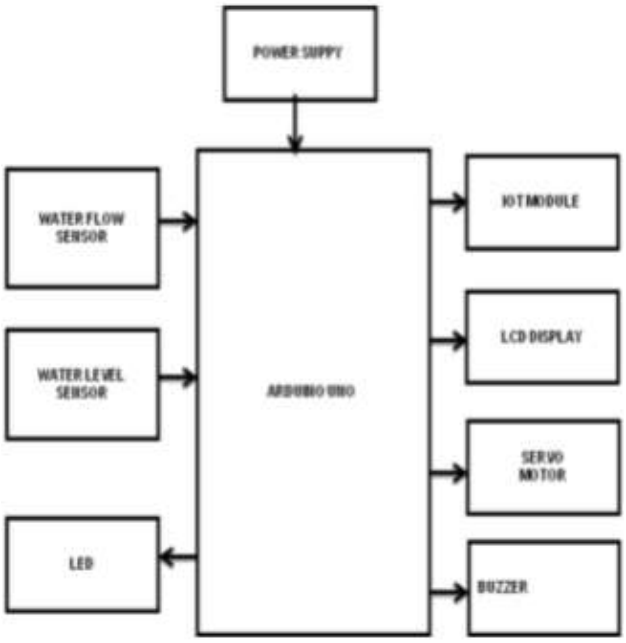

Fig1.Proposed model block diagram

The conditions needed to set off the audible and visual alarms are only met in this section. The IoT can be used to keep an eye on and control all system processes as well as individual actions. The main working part of the module is the ARDUINO UNO. The sensor system is made up of a water level sensor and a flow monitor. A lot of people use ultrasonic devices. The water flow indicator measures how fast the water is moving and stores that information. The water level monitor can tell you how deep or high the water is. The power source gets its DC power from a 12-amp converter. To open and close the gate quickly in an emergency, the servo motor controls it. The Internet of Things (IoT) element is always making changes to a webpage that users can see. So, the person can see what's going on with the bridge right now. The LED warning should let everyone know about the safety features of the bridge. With the help of touch-screen LCDs, anyone can find out more about how safe the bridge is. An ultrasonic monitor under the bridge measures the distance to the water in real time.When the distance drops below a certain level, the flow measure starts to guess how fast the water is moving. As the speed goes up, the LCD shows an extra message and the data is sent to the website. When the motor closes the gate, a buzzer lets people know that the entrance is dangerous and tells them not to go in.

As a big plus, the idea will be carried out automatically, which is great. The state of the bridge is also checked by the Internet of Things, which sends regular updates.

5.RESULTS

The safety features of the bridge are now being watched by someone. As suggested, the suggested answer makes it easier to keep an eye on and control people's safety. People will all be told right away if there is an Emergency.

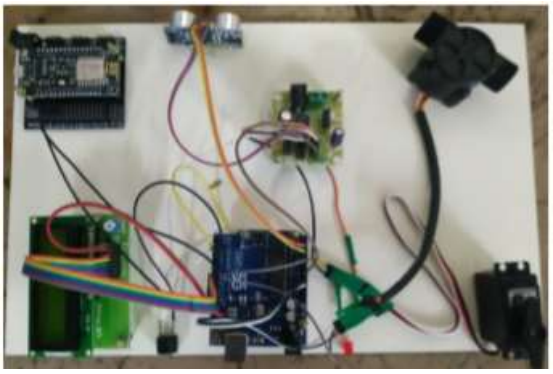

Fig2. bridge

Fig3.Waterlvel Indication

Fig4.Waterflowindication

Fig5.Floodalertindication

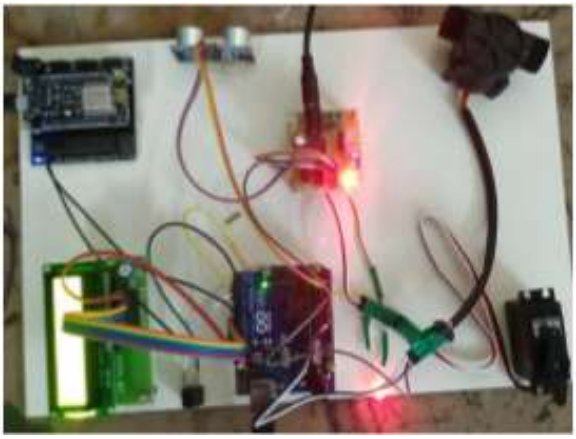

Fig6.Buzzer indication

IOT MONITORING SECTION

Click here for home

Clearlog

LogID	DATA	DATE_TIME
1	WATERLEVEL_HIGH	27/2/2020_13:5:58
2	WATERLEVEL_HIGH	27/2/2020_13:7:45
3	BRIDGE_IS_NOT_SAFE	27/2/2020_13:8:9
4	BRIDGE_IS_NOT_SAFE	27/2/2020_13:8:18
5	BRIDGE_IS_NOT_SAFE	27/2/2020_13:8:27
6	BRIDGE_IS_NOT_SAFE	27/2/2020_13:8:36
7	WATERLEVEL_HIGH	27/2/2020_13:9:37
8	WATERLEVEL_HIGH	27/2/2020_13:10:35
9	BRIDGE_IS_NOT_SAFE	27/2/2020_13:11:7
10	BRIDGE_IS_NOT_SAFE	27/2/2020_13:11:16
11	WATERLEVEL_HIGH	27/2/2020_13:12:18
12	BRIDGE_IS_NOT_SAFE	27/2/2020_13:12:42
13	BRIDGE_IS_NOT_SAFE	27/2/2020_13:12:59
14	BRIDGE_IS_NOT_SAFE	27/2/2020_13:13:8
15	BRIDGE_IS_NOT_SAFE	27/2/2020_13:13:16
16	BRIDGE_IS_NOT_SAFE	27/2/2020_13:13:33
17	BRIDGE_IS_NOT_SAFE	27/2/2020_13:13:42
18	WATERLEVEL_HIGH	27/2/2020_13:22:53
19	WATERLEVEL_HIGH	28/2/2020_7:41:43
20	BRIDGE_IS_NOT_SAFE	28/2/2020_7:41:59
21	FLOOD_ALERT	28/2/2020_7:42:8

Fig7.Cloudbasedserver

6.CONCLUSION

Some people think that an IoT-based system for tracking bridge safety should be put in place. The device constantly checks the state of the bridge using an ultrasonic sensor that is built into it. Each and every sensor gets the current number and sends it to the server and on to Android. All of the information will be shown on the digital screen, which could help keep accidents from happening. A message will be sent to the user if the sensor numbers go above a certain level.

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