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PRE-WARNING SYSTEM FOR WEAK BRIDGES AND HOUSES USING IOT

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Abstract-

In this project we are analyzing the performance of IoT based bridge health monitoring system to determine the water level, overall weight of the vehicles on the bridge, vibration and deformation. Using IoT network, we can reduce the risk of human errors and harm to the bridge caused by human and natural disasters can be minimized. In this project the alert is made about weak bridges and houses that may destroy and having a risk of collapsing. The main aim of the projects is to avoid hazards. Early warning systems are the systems by which the people receive relevant and timely information in systematic way. Early action can often prevent a hazard turning into a human disaster by preventing loss of life and reducing the economic and material impacts. In this system we use MEMS sensor for dislocation or uneven movement of the bridge or house, flex sensor is used to crack detection, and a ESP32 micro controller is used for processing the data and to react according to the instructions and alert the system whenever there is a uneven condition occured.

KEYWORDS: Real time information, Smart working, Easy tracking.

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1.INTRODUCTION

Human beings need shelter to live, so they have started building houses and buildings. A Bridge is a structure which connects two places. A bridge is a structure built to span a physical obstacle, such as a body of water, valley, or road, without closing the way underneath. It is constructed for the purpose of providing passage over the obstacle, usually something that is otherwise difficult or impossible to cross. Two things should be considered when you are building the foundations - the solidarity of the soil and the heaviness of the building and its contents. The causes of weak building or houses may be weak foundations, poor soil condition, poor materials - Materials that just aren't strong enough to withhold the load used in construction, unskilled or semi-skilled workers - Even when workers are given the right materials to make the concrete, they mix them incorrectly. This results in concrete, which is not of the sufficient strength to hold the load, the load is heavier than expected, the strength isn't tested and to cover a water body such as well, lake etc. and build a house or a bridge. In this system, we use MEMS sensor for dislocation or uneven movement of the bridge or house, flex sensor is used to crack detection, and a Atmega328 micro controller is used for processing the data and to react according the instructions and alert the system whenever there is an uneven conduction control. This system is composed of monitoring devices installed in the bridge environment, communication devices connecting the bridge monitoring devices and the cloud based server, a dynamic database that stores bridge condition data and a cloud based server that

Calculates and analyses data transmitted from the monitoring devices.

2.LITERATURE SURVEY

Jin-Lian Lee et al (2017) explained about that an IoT-based bridge safety monitoring system is developed using the ZigBee technology. This system is composed of monitoring devices installed in the bridge environment, communication devices connecting the bridge monitoring devices and the cloud-based server, a dynamic database that stores bridge condition data, and a cloud-based server that calculates and analyses data transmitted from the monitoring devices. This system can

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monitor and analyses in real time the conditions of a bridge and its environment, including the waters levels nearby, pipelines, air and other safety conditions. The detected data and images are transmitted to the server and database for users to have real time monitoring of the bridge conditions via mobile telecommunication devices. Pradeep Kumara V. H. D. C. Shubhangi (2020) discussed the impact of the bridges get damaged due to aging or damage due to natural calamities, the people will remain unnoticed of it. Then the bridges will be a danger to travel as it can collapse anytime and leads to disaster. So, continuous bridge checking must be done for better bridge health. For solving this problem, a design for continuous bridge monitoring has been proposed using wireless IoT technology. This proposed design helps in monitoring bridges and can also be applied for flyovers. The design consists of monitoring devices as sensors like load sensor, water level sensor, vibration sensor and tilt sensor which are interfaced with communication devices. For storing the status of a bridge, a database is used. The processor is being used for calculation and analysing the data which is received by the monitoring devices. The design monitors the real-time condition of bridges and flyovers. The proposed is implemented at a low cost.

3.EXISTING SYSTEM

In the existing system we are not having any realtime information about the weak bridges and houses. One has to go and check about the condition of the bridge and inform to the higher authorities. In the existing system we require a lot of manpower and time required process. And if any emergency if the human cannot reach the place then it may cause huge damage to human life and economical loss. Here in our project the real timr information is a main thing which will save a lot of time and make more efficient system for the process. The inbuit wifi will make updates on the server and we can gather information from there.

DISADVANTAGES OF EXISTING SYSTEM:

- No efficient methods used.
- More complex
- Time taking process
- Manpower required

4. PROPOSED SYSTEM:

In the proposed system we are using sensors which will give the timely information and

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can track the system anytime and anywhere we can gather information from the server which will be updated every second. In the proposed system we are using two sensors and a ESP-32 microcontroller. The two sensors are connected to microcontroller. The sensors senses the information and gives to microcontroller for processing. If there is any abnormality in the processed information then it will give inform to the authority with the email and a pop-up msg in the application.

ADVANTAGES OF PROPOSED SYSTEM:

- Pre action can often prevent a hazard turning into a human disaster by preventing loss of life.
- It reduces the economic and material impacts.
- By the pre warning system we can save water store in bridges.
- By pre warning system we can save fish pond ecosystem.
- Reduce the impact of hazards such as floods, landslides, storms and forest fires.
- Low cost: Requires fewer components and Digital components compared with the microwave equipment.

5. MODULES:

ESP-32

The ESP32 is actually a series of microcontroller chips produced by Espressif Systems in Shanghai. It is available in a number of low-cost modules. The ESP32 improved upon the ESP32 design in a number of ways. It offers both Bluetooth and BLE (Bluetooth Low Energy), whereas the ESP8266 only has WiFi (which, of course, the ESP32 also has). It is faster and is available in a dual-core design. It is also capable of operating in an ultra-low-power mode, ideal for battery-powered applications.

MEMS SENSOR

MEMS (micro electro-mechanical systems) technology has gone from an interesting academic practical implementation of MEMS technology has taken a while to happen. The design challenges involved in designing a successful MEMS product (the ADXL2O2E) are described in this article by Harvey Weinberg from Analog Devices.

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This sensing method has the ability of sensing both dynamic acceleration (i.e. shock or vibration) and static acceleration (i.e. inclination or gravity).The differential capacitance is measured usingsynchronous modulation/demodulation techniques. After amplification, the X and Y axis acceleration signals each go through a 32KOhm resistor to an output pin (Cx and Cy) and a duty cycle modulator (the overall architecture can be seen in the block diagram in Figure 3). The user may limit the bandwidth, and thereby lower the noise floor, by adding a capacitor at the Cx and Cy pin.The output signals are voltage proportional to acceleration and pulse-width-modulation (PWM) proportional to acceleration. Using the PWM outputs, the user can interface the ADXL2O2 directly to the digital inputs of a microcontroller using a counter to decode the PWM.

FLEX SENSOR

This sensor can detect flexing or bending in one direction. They were popularized by being used in the Nintendo Power Glove as a gaming interface. These sensors are easy to use, they are basically resistors that change value based on how much they're flexed. If they're unflexed, the resistance is about ~10KΩ. When flexed all the way the resistance rises to ~20KΩ. They're pretty similar to FSRs so following this tutorial will get you started. You can use an analog input on a microcontroller (with a pull up resistor) or a digital input with the use of a 0.1uF capacitor for RC timing.The bottom part of the sensor (where the pins are crimped on) is very delicate so make sure to have strain relief - such as clamping or gluing that part so as not to rip out the contacts! A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending.

6.RESULT

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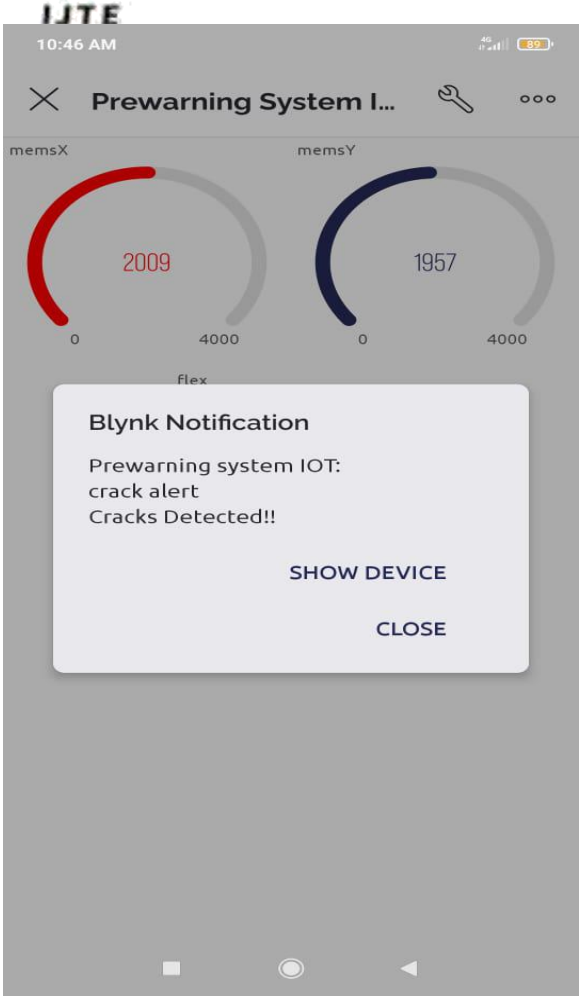

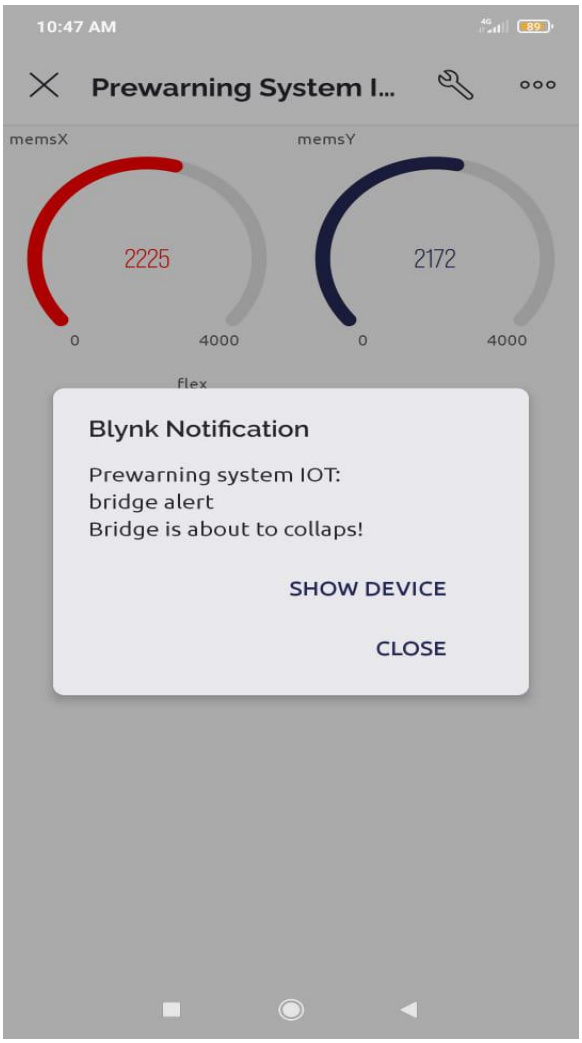

7. CONCLUSION

Pre warning systems are the systems by which people receive relevant and timely information in systematic way. In pre warning system alert is made about weak houses and bridges that may destroyed and having a risk of collapsing. The main aim of this project is to avoid hazards The bridge health and house health system used several sensors to detect the behaviour of a bridge

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and house such as bridge deformation and damage. The sensors connected to the data logger and subsequently sent the information data such as coordinates and crack to the microcontroller. The data is used as input by microcontroller within the system and gives as a command to the alerting unit. The project mainly focus upon developing an IoT Based Bridge Health Monitoring System. The system was designed with the help of various type of sensors (Float, Vibration, Flex and load cell) and Arduino mega micro-controller and IoT module. There are many objectives focusing towards development of Software and Hardware, firstly deploying various sensors on the bridge for gathering different parameters of the bridge as mentioned in the chapter 2. Second objective is estimation of threshold of different parameters by the signal obtained from the sensor, to create a network around the bridge to send the periodic information to the control room and finally creating a local cloud with the help of IoT module and uploading the information of the bridge to cloud. By constructing the prototype of the bridge for achieving the above listed objectives. The sensors has been successfully deployed and tested with different threshold values and set points. The sensors were tested on the bridge surface and gave expected result as discussed in the results section. The IoT Based Bridge Health Monitoring System was implemented by using IoT module with the help of libraries and coding environment based on the C programming. Bridge algorithm was successful in detecting the values by outlining the object of interest and identifying the vibration, water level, deformation and load of the vehicle on bridge for future.

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