# IOT SYSTEM FOR REMOTE MONITORING OF BRIDGES: MEASUREMENTS FOR STRUCTURAL HEALTH AND VEHICULAR TRAFFIC LOAD

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**Abstract -** *Bridge protection is essentially important to prevent bridge damages from natural disasters such as typhoon flood, earthquake, etc. The attention on hydraulic caused bridge failure has been received due to scour problems. However, in-situ bridge scour monitoring is still one of the rugged works for researchers in their field applications. It is necessary to ensure that the bridge monitoring system under natural disasters is able to function well. By sending warning signals, the real-time information can provide engineers to make right decision and take appropriate actions in time while the bridge damage happens. This project consists of a float sensor which is special type of sensor in which the resistance value is varied depending upon the water level. The variable resistance obtained from the float sensor is converted into variable voltage signal through voltage converter circuit. The converted voltage signal is given to ADC. ADC is nothing but Analog to Digital Converter which converts the analog signal from the float sensor to corresponding digital signal. Then the converted digital signal is given to micro controller. In the same way microcontroller will measure the weight of the vehicle through load cell. Measures the vibration through vibration sensor. Any of the occurrences happened; microcontroller will makes alarm to alert people about the bridge damage and all the information are monitored in the mobile phone/ PC using IoT module through cloud communication.*

***Key words:*** **load cell, lcd, micro controller, buzzer, arduino**

## 1. INTRODUCTION

Bridge protection is essentially important to prevent bridge damages from natural disasters such as typhoon flood, earthquake, etc. The attention on hydraulic caused bridge failure has been received due to scour problems. However, in-situ bridge scour monitoring is still one of the rugged works for researchers in their field applications. It is necessary to ensure that the bridge monitoring system under natural disasters is able to function well. By sending warning signals, the real-time information can provide engineers to make right decision and take appropriate actions in time while the bridge damage happens. This project consists of a float sensor which is special type of sensor in which the resistance value is varied depending upon the water level. The variable resistance obtained from the float sensor is converted into variable voltage signal through voltage converter circuit. The converted voltage signal is given to ADC. ADC is nothing but Analog to Digital Converter which converts the analog signal from the float sensor to corresponding digital signal. Then the converted digital signal is given to micro controller. In the same way microcontroller will measure the weight of the vehicle through load cell. Measures the vibration through vibration sensor. Any of the occurrences happened; microcontroller will makes alarm to alert people about the bridge damage and all the information are monitored in the mobile phone/ PC using IoT module through cloud communication.

### 1.1EXISTING SYSTEM

This existing work is to control all AGVs through wireless communication system, here the vehicle will be able to communicate via wireless static control central mode (WSCCM) as each vehicle employed as node so that the data processed more efficiently. Now, AGV system adopts the WSCCM , in this method vehicles are controlled as well as conducted by a main control unit center but they can't communicate with each other. AGV is now used with the improvement of logistic tech in modern automatic warehouses for its features of auto guidance, accurate positioning, optimal route and safety. The main goal of AGV is to travel between various manufacturing stations to improve productivity, increase automation and reduced labor cost in warehouses. Therefore, the design of the AGV is determined and all the tests in the station have been completed. Observation proved that after testing in each part of the program, AGV can obtain the order for following line, find the right route, detecting the station, stoppage, and informing its location

### 1.2 PROPOSED SYSTEM

Rise/fall in ambient temperature. Flame sensor: A flame sensor module that consists of a flame sensor (IR receiver), resistor, capacitor, potentiometer, and comparator LM3 In this design includes a single microcontroller, temperature sensor, flame sensor, PIR sensor, ESP 32 camera module, driver relay with door open/close mechanism, IoT module (ESP 8266-12E NODE MCU)& IR sensor. Apart from the server entire unit is placed within warehouse or cold storage. Sensor: - It is electronic component which sense physical quantity such as temperature, flame, motion and convert it into electrical equivalent signal called as sensor. Here the output voltage varies by 10mV in response to every degree Celsius 93 in an integrated circuit. The far-infrared flame probe converts the light detected in the form of infrared light into current changes.PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. Here two parameters temperature and light are controlling using Arduino ATmega328P controller. Arduino located at the center of the block diagram is the control unit for each node. Program is being embedded within a Arduino. Which helps to take action based on inputs provided by output of the sensors. The relay will turn on based on condition. In this proposed system, IR sensor is used to detect the door open/close status and updated to the cloud PIR sensor is senses the human/animal/birds motion inside the warehouse while door is closed. Once PIR sensor gets sensed, image is captured and sends to the authorized person through cloud (e-mail). Temperature and flame sensor checks, if there is any change in temperature and flame level within the warehouse or cold storage facility and sensor signal send to the Arduino Uno module and then updated to cloud using IoT module and our system alert through GSM module. The GSM module is used to send the SMS to authorized persons contact number. Fire extinguisher turned ON automatically based on temperature and flame level inside the warehouse.

## 2. IOT MODULE

**NodeMCU** is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi So C from Espress if Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

The *Internet of things* (IoT) is the network of everyday objects — physical things embedded with electronics, software, sensors, and connectivity enabling data exchange. Basically, a little networked computer is attached to a thing, allowing information exchange to and from that thing. Be it lightbulbs, toasters, refrigerators, flower pots, watches, fans, planes, trains, automobiles, or anything else around you, a little networked computer can be combined with it to accept input (especially object control) or to gather and generate informational output (typically object status or other sensory data). This means computers will be permeating everything around us — ubiquitous embedded computing devices, uniquely identifiable, interconnected across the Internet. Because of low-cost, networkable microcontroller modules, the Internet of things is really starting to take off. NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications. NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

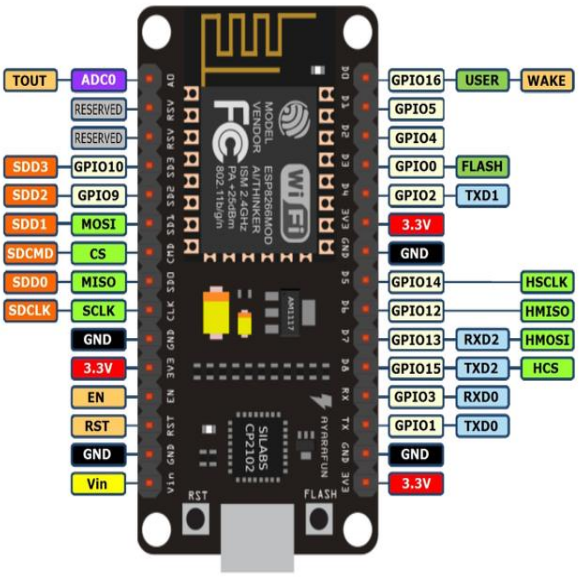


**Fig -1**: node mcu

## 3. CONCLUSION

Here we have discussed the different methods used by the researcher to monitor the bridge condition. Such a system will help to control the dynamic parameters of the bridge for preventing it from the disaster which can save the many lives and also wealth. This system is unique in its ability to monitor the bridge environment, transmit the environmental data through wireless communication and send alerts to the bridge management staff in real time for prompt reactions. This system can enable 24x7bridge safety management as well as prompt and appropriateResponses to emergency incidents.The system continuously monitors the bridge parameter value and judges whether the bridge is safe or not for traveling. In case the parameter values are beyond the threshold values then an alert sound is given to the people. This implementation is greatly useful to provide safety for the human.

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