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INTERNET OF THINGS AND CLOUD COMPUTING FOR AGRICULTURE

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ABSTRACT

In the existing systems, Zig-Bee technology was used which is cost consuming and quite timeconsuming,but this system used theTCP/IPprotocol which issuitedforalltypesofbridges.

Therefore in this study, the IOT wireless sensor network and smart building technologies areadoptedtosolvethevariousproblemsofbridgesafetyinformationtransmissionandmanagementbydevelopinganIOTbasedbridgesafetymonitoringsystemcapableofmonitoring the environmental data of a bridge and transmitting the data to the mobile devicesofbridgesafetymanagementstaffforreference anddocumentation.

In this study, Bridge safety monitoring system using IOT is developed using the Wirelesstechnology. With the help of Advancements in sensor technology and ESP8266

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wi-fi module, have brought the automatedreal-timebridgehealthmonitoringsystem.Thissystemwill helppreventionindisastermanagement and recovery. IOT-based bridge safety monitoring system is developed using theWirelessTechnology.

Chapter1

INTRODUCTION

Bridge is one of the most important transportation infra-structure for social and economicactivitiesofcountrywhich haslongrivers.Bridgemonitoringsystem(BMS)provi despreviousindication to us where we can easily save too many lives and we can avoid the loss. BMS is atool to improve the safety and maintainability of the bridge. BMS provides real time and accurate information about the structural health condition. It is a process of mode structiveevaluations to detect location and extent of damage, calculate the remaining life, and predictupcoming accident. Bridges and flyovers are critical in many regions, being used for severaldecades. It is critical to have a system to monitor the health of these bridges and report whenand where maintenance operations are needed. Advancements in sensor technology havebrought the automated real time bridge monitoring and alert generation system. Many longspan bridges in Korea and in Japan have adopted this real time health monitoring system.However,currentsystemusescomplicatedand highcostwirednetworkamongstsensorsinthebridge and high-cost optical cable between the bridge and the management center, whichincreases the overall cost of installation and maintenance cost of monitoring system. Thecomplicated wiring also makes the installation and repair/replacement process difficult andexpensive. Flyovers and highway bridge systems are critical in many regions, being used overseveral decades.Itiscriticaltohaveasystem tomonitorthehealthofthesebridgesandreportwhenan dwheremaintenanceoperations areneeded.

A major revolution in bridge came with the construction of the iron bridge in Shropshire,Englandin1778.Itused pigironforfirsttimefortheconstruction ofarchestocrossthewaterbodies. Bridge management program consisting of joint monitoring and testing of structuralfitness. Testing must be carried out by the engineers who are expert in the field of bridgemonitoring in such a way that to monitor the bridge on a regular basis, to inspect the bridge'soverall health twice a year, a simple test must be performed every one to four years and acrucial inspection every eight years. It results in a far greater gain, using present bridges thatcan be used for past the recorded lifespan. Bridges vibrate under heavy load and this adds tothe heat, to a greater or lesser degree. Given weaker structures, vibration and dynamics aregenerallymoresignificant.Whilethebridgerespons etotheloadingappliediswellunderstood,thetrafficloa dingappliedtothebridgeitselfisstillbeinginvestigated. Thisisamajorproblemasloadingishighlyvariable,esp eciallyforbridges.Loadingeffectsinbridges(stress,be nding, moments) are designed for the use of load and resistance factor design principles. There aremany different methods used for monitoring the bridge condition. Many long-range bridgesare now monitored routinely with a wide range of sensors. Many types of sensors are

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used,includingstraingauges,waterlevelsensors,vibrationsensorsandflexsensors.Largerbridgesareroutinelymonitoredbyvariouselectronicsensorsandrelatively smallerbridgesarevisuallyinspected. Research is underway to monitor smaller bridges, as they are often remote and donothaveelectricalpower.

Chapter2.LITERATURESURVEY

Theproposedsystemsoftwareisdividedintoseveralfunctionalblockstocollect,transmit,log,process and asses the bridge status using a fuzzy logic-based algorithm. In addition to that, afriendly user graphical interface and Google map-based GIS to display the real-time andhistoricalstatusofthemonitorbridge.Intheprocess,MATLABfuzzylogic,databaseandwebservicesoftwaretoolswereutilizedtodevelopandtestthesystem.The presentedsensorsystemconsists of under-water sensor nodes with the wired Power over Ethernet technique. Theproposedunder-watersensornodeis implementedwithtwostackedoctagonPCBsandenclosed in a steel hollow ball and then setup in the steel cage. The proposed architecture ofthe bridge scour monitoring system owns the scalability and flexibility for mass deployment.The presented rugged sensor system is now setup in Ming-Chu Bridge in Taiwan to monitorthe bridge scour condition. This section describes the system development which includesselected sensors, implementation tools, system architecture and structural damage detectionalgorithm.Thealgorithmisdesignedbasedupon thegraphtheorynamelytheWeightedAttackGraph (WAG) which is an extension of the decision tree and is widely used in computernetworksecurityanalysis.

The main points of LW are low power consumption and real-time data collection. For thesetwotargets,weproposeasuitablenetworkframework.Itconsistsoffourkindsofdevices,i.e.,DataCollectionDevice,Basestation(AccessPoint),Router(RangeExtender)andEnd-device.Data Collection Device (DCD) is the control center of this system. All of the users controlprograms and collected data samples are run in data collection device. Wireless node modulecontains Router and Sensor Node (End-device). Sensor node is used for sampling vibrationdataandrealizingreal-timetransmission.Routerisusedforextendingwireless communicationdistance of data acquiring system. This work describes the method of example style anddevelopmentofawirelessembeddedsystemthatusesspecificmeasuringsystemsensorstogetknowledge relevant to health watching of bridges. This paper includes the necessity analysis,style and implementation of a system example exploitation principally free or low-pricedtechnologies. The example conjointly includes an online interface that permits analysis ofbridge vibrationknowledgeamongdifferentoptions.

At present, WBMS is becoming extremely important for high-speed transit routes and forgrowingconveyancetransportnetwork.Theanalysisworkasawholedemonstratesthe observation of some essential word of bridge that square measure needed to observe the agingbridges.Remotelybuiltbridgesrequirecontinuousmonitoringandmaintenanceofsafety.Thesensing technology and the rapid process talents of the process unit make a man-made effortfor structural observation. Computer kit and programming development initiatives build aframework that is economical and free from any external system issues. And the WirelessBridge Watching Systems (WBMS) will simply determine the health status

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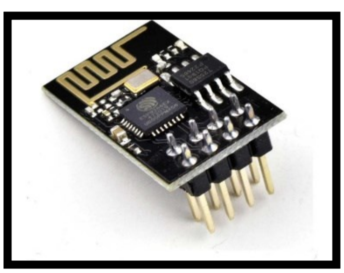
and predictabilityofupkeepwork.

State bridge engineers are responsible for many aspects of bridge networks. Due to the largenumber of systems that are available, it is impossible for an engineer to sort through all thesesystems without knowledge of: (a) the capabilities of a particular system and (b) whichcompanies offer particular systems and services. This report briefly explains the concepts,advantages, and disadvantages behind commercially available health monitoring systems. Itsimplifies the task for system selection, from the large number of commercially availablesystems that exist, using a computer program to find the system that best fits the needs of aspecific bridge. This project aims to simplify the system for selecting bridge tracking devices.Many bridges within India are obsolete or structurally deficient to safely increase the life ofthosebridges,theinspectionwouldbevital.Bridgeengineershavemanydutiesandit'sfarnotpossible to expect one to know. Our device will sense the crack inside the bridge and signalmightbegiventogovernrooms.Thesensorsandt heLCDareinterfacedwiththeAt-mega.Thesensors used are Flex. The value is set so that if there is any sort of tilt or little crack and if itcrossesoursetvalu ethen thecrackisdetected.



Therefore, in this study, the IoT wireless sensor network and smart building technologies areadoptedtosolvethevariousproblemsofbridgesafet yinformationtransmissionandmanagementbydeveloping anIoTbasedbridgesafetymonitoringsystemcapa bleofmonitoring the environmental data of a bridge and transmitting the data to the mobile devicesofbridgesafetymanagementstaffforreference anddocumentation.

Chapter3:METHODOLOGY

Themain objectivesofthebridgemonitoringsystemare:

1. Toprovidesafetyforbridges.
2. Toavoidaccidentsincaseof badweatherconditions.
3. Toimprovethebridgeefficiency.
4. Toovercomethetechnicaland costobstacles.

3.1 SystemArchitecture:

Thesystem containsoffollowing parts:

3.1.1 ESP 8266 Wi-Fi Module:

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Figure 3.1.1 ESP8266 Wi-Fi module

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3.1.2 Arduino Uno board:

The Arduino uno is an open-source microcontroller based on the microchip atmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion-boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

Figure 3.1.2 Arduino uno

3.1.3 Water Level Sensor:

Ultrasonic sensor used to detect the level of substances thatcanflow.Thesekindsofsubstances.Thesemeasurementscanbeusedtodeterminetheamountofmaterials withinaclosedcontainerortheflowofwaterinopenchannels.

Figure3.1.2 Ultrasonic sensor

3.1.4 Vibration sensor:

Vibration sensors are piezoelectric accelerometers that sense vibration. They are used for measuring fluctuating accelerations or speeds or for normalvibration measurement. ... Examples of applications where the vibration sensors are used:processcontrolsystems,aerialnavigationandunderwater-applications.

Figure3.1.3 vibration sensor

3.1.5 Servo Motor:

A servo motor may

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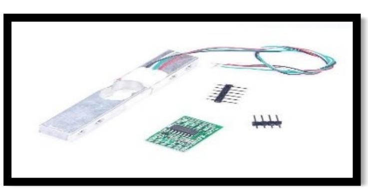
be a simple motor, controlled with the assistanceof servo mechanism. The motor as a controlled device, related to servo mechanism is DCmotor, then it's commonly referred to as a DC Servo Motor. If AC operates the controlledmotor,it'sreferredtoas aACServomotor.

Figure3.1.4 servo motor

3.1.6 Weight-Sensor(HX711):

The HX711 load cell amplifier module is uses 24 highprecision ADC converter ship HX711, is meant for high-precision electronic scale and style,with two analog input channel, the interior programmable gain amplifier was integrated withmultiplier128.HX711usesa twowireinterface(Clock &Data)forcommunication.

Figure 3.1.5 HX711 weight sensor



It has a technology called MBM (Monitoring Based Maintenance) that enables maintenanceengineers to monitor the condition of the bridge in real time. The components that which areused to detect the strain, acceleration, cracks etc. The system includes the desktop applicationand server which is useful for the engineers working in the bridge department to monitor thecurrentpositionofbridge.

There are three important chunks in the system i.e., Vibration Sensor, weight sensor and Riverwater level sensor, which sends the details of bridge strength to the Management Center.Allthecollectedenvironmental datasentto theserversystem.So thatas persituationManagement Center takes immediate action for bridge safety and security. For example ifwaterlevelincreasesbeyondthedefaultsettledwater-levelthensystemalertsthemanagementcenterandbarriers ofbridgewillautomaticallyclose bymanagementcenter.

Working:

AsthesensorsareconnectedtotheArduino Uno,ithasthemicrocontrollerchip. It has the 14 in-out digital (d0-d13) pins and 6 analog pins(a0-a6). So, we canconnect many sensors in a single system. The vibration sensor detects any kind of vibration,motion on the bridge, it produces a signal that is transferred to the module and that data/signalisalsotransferredtotheserverthroughwi-fi (ESP8266)networkwhichisexternally connected to the Arduino uno.

Asthewaterlevelintherivermayincreasestheultrasonicsensordetectsitandsendsthesignalto Arduino uno modulewhichcollectsdataandsends thatdatatotheserver through wi-fi module.

Iftheload/weightonthebridgeincreasesandthatcauses

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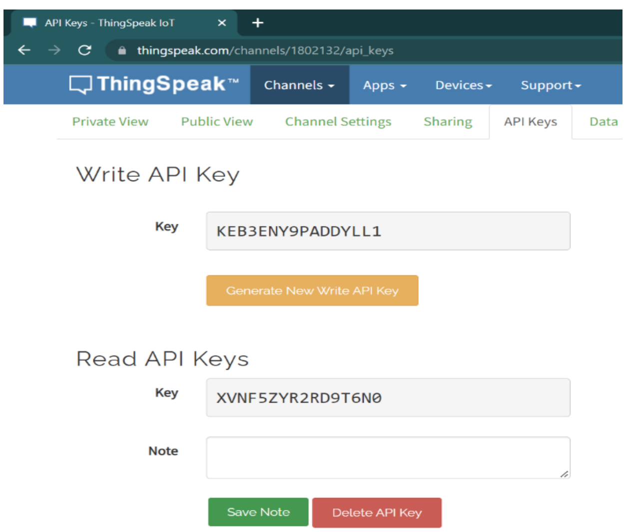
thebridgetocollapsethentheweightsensor (HX711) detects overload weight and sends that data to the module which afterwardssends that data to the server. All of the data of the sensors collected by Arduino module and it transfersthatdatatotheserver through ESP8266 wi-fi module.

The management staff can observe the health of the bridge on the website/server to takeprecautions. And if all the sensors detect at a time, then the gates of the bridge will closeautomatically and the alarm will be activated and to avoid the collapse of bridge the alarm soundwillactivated.

Chapter 5



RESULTS AND DISCUSSION:

Figure 5.1 Thingspeak server API key generated.

In the Thinspeak.com server, it generates two API keys for read and write, that keys are used in program to control the sensor using wireless communication and observe the data of the sensors which are connected to the Arduino board on the bridge.

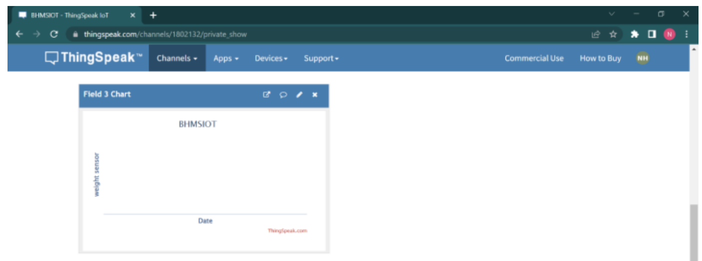


Figure 5.2 Observation of the sensors data through graphs at server.

In the figure 5.2, it shows the updates of the sensor through graphical representation, as it describes the field1, field2 and field3, which represents the vibration of the bridge, water level detection in the field1 and field2 respectively.

Figure 5.3 graphical representation of weight sensor.

In this figure the weight of the bridge is shown in the graphical representation in feild3 labelled, as the weight is increased, the graph level increases and it has to controlled through clearing the traffic or vehicles on the bridge through viewing this graph.

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As the sensors reaches their maximum point the management staff takes the precautions as the vehicles will cleared and the bridge gates will be closed to avoid any kind of the destruction to the bridge occurs due to flood, or heavy weight on the bridge.

Chapter6: APPLICATIONS

1. Itisusefulforpublicsafety andreduction inhuman losses.
2. Thissystem will helpin disastermanagement andrecovery.
3. IoTbasedbridgesafetymonitoringsystemisd evelopedusingtheWSN(WirelessSensorNet work)technology.

Chapter:7

ADVANTAGES DISADVANTAGES:

Advantages:

1. Lowcost and reliable.
2. TheESP8266node-mcumoduleandadvancementssensorsareused toprovidethebridge healthdata/statustomanagementstafftotakep recautions.
3. Mainpurposeof thissystemisfor publicsafety.

Disadvantages:

1. Complex to design and installation.
2. High maintenance.
3. Wi-fi connectivityhastobebetterand statusofthebridgehealthtomanagementstaff.

Chapter 8

CONCLUSION&FUTURE SCOPE:

We propose an integrated bridge monitoring system using IOT that can be used to prevent accidents or structural disasters of flyovers and. All sensors get the real-time value and send it to the server. If the sensor value is above then the limit then the system will notify to the management staff and they take precautions by clearing the heavy vehicles on the bridge and closes the bridge.

Future Scope:

System can be implemented at a global level in which different countries can manipulate data of their bridges at a single server.Implement on high-cost suspension bridge.Monitoring Structural Performance and Applied Loads.

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