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Smart Bridge of Morbi

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A B S T R A C T

This essay provides a quick overview for the background history behind the construction of bridge. A nation's transportation system is built on bridges, yet they are expensive to construct and maintain. Therefore, the bridges should be treated with care. Sensor are employed for that purpose. The concept are managing several parameters through correct operation, monitoring, and data analysis is successful in preventing damage to the bridge. The main goal of this project is to monitor and the assess the status of bridges using various sensors.

The bridge was built with the idea that only a certain number of people could cross it, and is known as the "SMART BRIDGE OF MORBI". It is the most established bridge because of this. Taking into account the average weight of individuals. Bridge sensors detect when the limit of the bridge has been reached that is overloaded, at which point barricades are closed. The bridge sensor's detect when a person exit and immediately open the gate so that they can enter to meet the bridge's requirement.

Keywords: It is a modern bridge across a river. It is two-way bridge with two lanes and two tollgates on each side. Person Detection and Limiting the passenger's.

INTRODUCTION

This paper gives a brief idea about the historical background about the development of bridges. Bridges are the foundation of a country's transport network but they are expensive to build and maintain.

A bridge is a construction made for carrying the road traffic or other moving loads in order to pass through an obstacle or constructions. The required passage may be for pedestrians a road, a railway, a canal, a pipeline etc. Bridges are important structures in modern highway and railway transportation systems and generally serving as lifelines in the social infrastructure systems. Design of bridges vary depending upon the function of the bridge, the nature of the terrain where the bridge is constructed and anchored, the material used to make it, and the funds available to build it. Most likely the earliest bridges were fallen trees and stepping stones, while Neolithic people built broad walk bridges across marsh land

Ancient Structures

It will never be known who built the first actual bridge structure. Our knowledge of past days fades the further we look back into time. We can but assume that man, in his search for food andshelter from the elements and with his given curiosity, began exploring his natural environment. Crossing creeks and crevices with technical means thus was a matter of survival and progress,and bridges belong to the oldest structures ever built. The earliest bridges will have consisted ofthe natural materials available, namely wood and stone, and simple handmade ropes. In fact,there is only a handful of surviving structures that might even be considered prehistoric, e.g. the so-called Clapper bridges in the southern part of England, as Brown (1993) notes.

Ancient Structural Principles

The earliest cultures already used a variety of structural principles. The simplest form of a bridge, a beam supported at its two ends, may have been the predecessor of any other kind of bridges perhaps turned into reality through use of a tree that was cut down or some flat stone plates used as lintels Arche and cantilevers can be constructed of smaller pieces of material, held together by the compressive force of their own gravity or by ropes. These developments made larger spans possible as the superstructure would not have to be transported to the site in one complete piece anymore. Probably the oldest stone arch bridge can be found crossing the River Meles with a single span at Smyrna in Turkey and dates back to the ninth century BC (Barker and Puckett 1997). Even suspension bridges are no new inventions of modern times but have already been in use for hundreds of years. Early examples are mentioned from many different places, such as India and the Himalaya, China, and from an expedition to Belgian Congo in the early years of this century (Brown 1993). Native tribes in Mexico, Peru, and other parts of South America, as Troitsky (1994) reports, also used them. He also mentions that cantilevering bridges were in use in China and also in ancient Greece as early as 1100 BC. Podolny and Muller (1982) give information on cantilevering bridges in Asia and mention that reports on wooden cantilevers from as early as the fourth century AD have survived.

Trial and Error

In some cases, authors of books or book chapters on the history of bridges use terms such as primitive, probably as opposed to the modern state-of-the art engineering achievements. It is spoken of a lack of proper understanding, and of empirical methods. From today's point of view it is easy to come to such a judgement, but one should be careful not to diminish the outstanding achievements of the early builders. In our technical age with a well-developed infrastructure,computer communication, and heavy equipment readily available it is easy to forget about the real circumstances under which these structures were built. Since mathematics and the natural sciences had yet even begun being developed it is not astonishing that no engineering calculations and material testing as adhering to our modern understanding were performed. But a feeling for structures and materials was present in the minds of these ancient master builders.With this and much trial and error they built beautiful structures so solid and well engineered that many have survived the centuries until our days.

The Earliest Beginnings

Earliest cultures to use bridges according to our current knowledge were the Sumarians in Mesopotamia and the Egyptians, who used corbelled stone arches for the vaults of tombs (Brown1993). In the fifth century BC the Greek historian Herodotus, who lived from about 490 to 425 BC (Brown 1993), wrote the history of the ancient world. His report on the city of Babylon includes a description of the achievements of Queen Nitocris, who had embankments and a bridge with stone masonry piers and a timber deck built at the River Euphrates. This bridge is believed to have been built in about 780 BC (Troitsky 1994) and was built as described in the following (Greene 1987, p118).

WORKING PRINCIPLE

Bridges are continuously subjected to destructive effects of material aging, widespread corrosion of steel reinforcing bars in concrete structures,corrosion of steel structures and components, increasing traffic volume and overloading, or simply overall deterioration and aging. These factors,combined with defects of design and construction and accidental damage, prompt the deterioration of bridges and result in the loss of load carrying capacity of bridges. The condition of heavily used urban bridges is even worse: one in three are classified as aging or unable to accommodate modern vehicle weights and traffic volume. need strengthening, rehabilitation, or replacement, but public funds are not generally available for the required replacement of existing structures or construction of new ones. Many sensors are being used to monitor the bridge remotely and using various sensors and Latest Technology which is internet of things which will help us directly to connect with sensors and also the heart of our project is the Arduino Uno which will be used to connect all the sensors and link everyone together. A WI-FI (Wireless Fidelity) Module which esp2866 Is used to connect all the sensors to the data centre and helps to manage the bridge Remotely. A barrier system is been used so that whenever the parameters of the bridge cross the value the barrier will close and the bridge traffic will be stopped. So, considering these parameters the bridge monitoring system will work and give the desired output.

PROPOSED SYSTEM

The sensors and the LCD are interfaced with the Arduino UNO. The sensors used are Flex and Water level. The Flex sensor measures the angle of tilt of the bridge as well as cracks. The value is set so that if there is any sort of tilt or little crack and if it crosses our set value then the crack is detected. The water level sensor will be placed below the bridge and within the gaps. When the water touches the sensor, it will give alertness to the Arduino UNO. Then the alarm will beep. An LCD is kept so that if there is any danger and if the system finds the fault then the LCD will display "DANGER". Servo motors are also there to closed the roads so that no vehicle reach the bridge. It is placed before the bridge. A buzzer is also used to spread alertness when the danger is detected. The wi-fi modem is used to send the data to the server. In this research work used "THINGSPEAK" were we can see the reading of the sensors.

METHODOLOGY

A bridge is a structure built to a span of 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 can be detrimental to cross otherwise. In our project, we are designing to ease the overcrowding and prevent any future collapse of the bridge due to one or more reasons. First we have to connect all the sensor to arduino and an IC especially for power supply of servo motor after connecting all the sensors to arudio uno we have to run a special programme from a computer while connecting the arduino by usb port which will help us making the smart bridge. The sensors used are capable of doing high quality work and we can rely on this type of machines. The sensors and components we used are Arduino uno motor which is the main component of the smart bridge model The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect with usb to computer. IR Proximity sensor is a sensor which can detect the object passing by the sensor. We have to connect this sensor with aruduino, we have use two such sensor for each two tollgates.Servo motor - Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. LCD connection is simpler it will show us the all the information required information. Main thing after connection of all sensor and giving power supply is that we have to run a programme to count all the persons entering and exiting through the gate. In arduino programme we have to run this code lines and after successfully completing the running of code lines we have to upload this programme in the our aruduino uno circuit. Now after completing all this our smart bridge model is ready. We can see the no of persons entering the tollgates on the LCD screen installed on the main gate of the bridge. The sensors will automatically force the

gate to close after the no. of pedestrian who can enter the bridge is same to the limited no we have set in our programme. This can reduce overcrowding and this will help us in meeting all the safety guidelines of the bridge

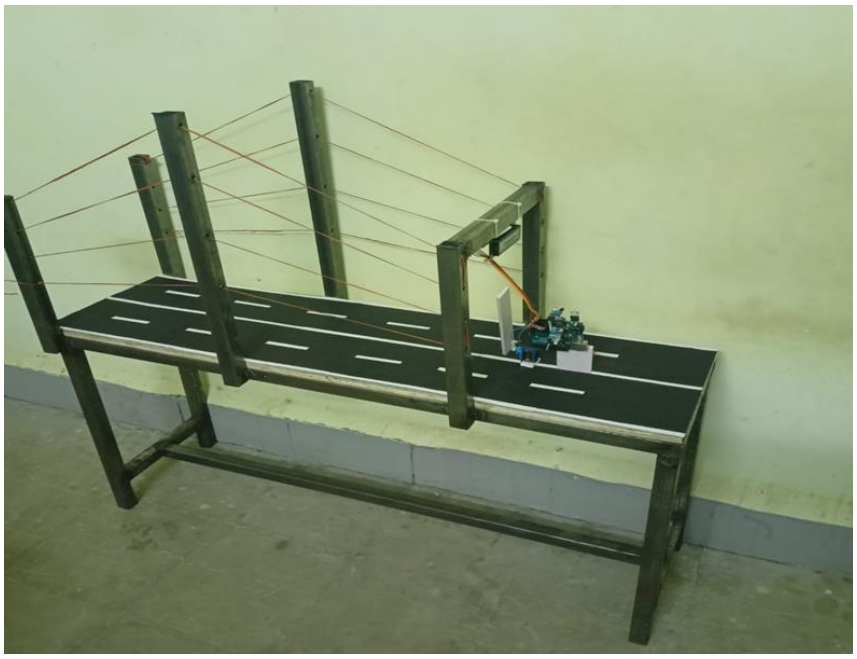


Fig. 1 - (a) first picture; (b) second picture.

Description of sensors:

• **ARDUINO UNO:** Arduino Uno is an open-source electronics platform based on easy to-use hardware and software. It has a wide range of applications and is a major microcontroller board because of its small size and flexibility. It has 22 input/output pins in total,14 of these pins are digital pins,8 analogue pins, 6 PWM pins among the digital pin. It also has a mini USB Pin which is used to upload code and Reset button. It is used in Embedded systems, automation, robotics, etc.

Servo motor

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller.

You can use any servo code, hardware or library to control these servos.

Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.

IR Proximity Sensor-

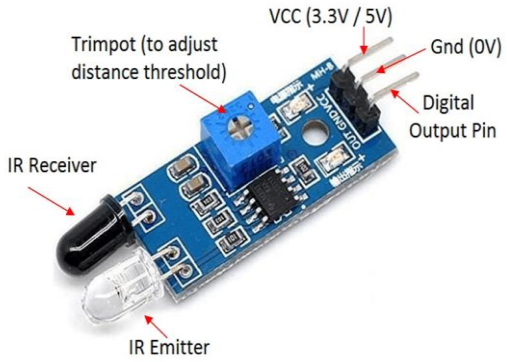
The Multipurpose Infrared Sensor is an add-on for your line follower robot and obstacle avoiding robot that gives your robot the ability to detect lines or nearby objects. The sensor works by detecting reflected light coming from its own infrared LED. By measuring the amount of reflected infrared light, it can detect light or dark (lines) or even objects directly in front of it.

An onboard RED LED is used to indicate the presence of an object or detect line.

Sensing range is adjustable with inbuilt variable resistor.

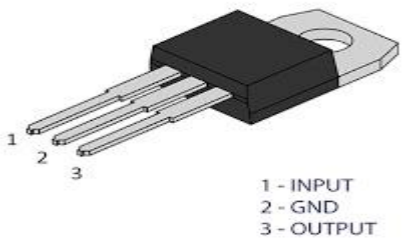
The sensor has a 3-pin header which connects to the microcontroller board or Arduino board via female to female or female to male jumper wires.

A mounting hole for easily connect one or more sensor to the front or back of your robot chassis.

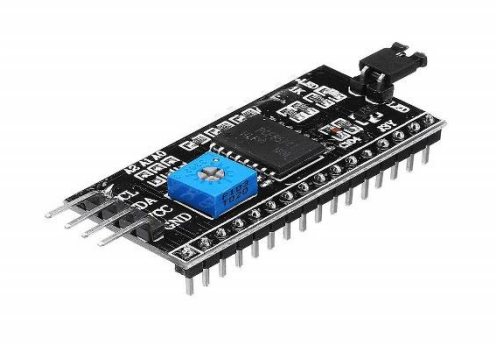


NPN Epitaxial Silicon Transistor

This NPN Silicon Epitaxial transistor is designed, for use in linear and switching applications.



LCD circuit – It displays the information gathered by all the sensors and programs which is useful foradministration



LCD – It is the LCD Screen

CONCLUSION

The smart bridge is very advance type of bridge monitoring system. The main advantage of this bridge system is that it can extend a network by acting as a repeater. Bridges can reduce network traffic on a segment by subdividing network communications. It can provide safety during natural disasters. Bridges increase the available bandwidth to individual nodes because fewer nodes share collision domain. This also reduces collision.

Even though the quality of material used and components used are of good quality, the cost of the project is not so costly and it can be used and implemented in all movable bridges without much increment of cost. This smart bridge is best in its field and will be most widely used and advance system.

REFERENCE

• [1] S. Joshi, N. Naga, and U. Rajesh. Experience of Management of Bridges Prior to and Post Evaluation of BMS on NH network of India. In

Proceedings of IABMAS 2018, Melbourne, Australia, 2018.

• [2] S. Joshi and S. S. Raju. Indian Bridge Management System – Overview and Way forward. In Proceedings of IABMAS 2018, Melbourne, Australia, 2018.

• [3] P. S. Marsh and D. M. Frangopol. Reinforced concrete bridge deck reliability model incorporating temporal and spatial variations of probabilistic corrosion rate sensor data. Reliability Engg. and System Safety, 93(3), 2008.

• [4] U. M. Angst. Challenges and opportunities in corrosion of steel in concrete. Materials and Structures, 51(4), 2018.

• [5] R. A. Rogers, M. Al-Ani, and J. M. Ingham. Assessing pre-tensioned reinforcement corrosion within the New Zealand concrete bridge stock.

Technical report, NZ Transport Agency research report 502, Wellington, New Zealand, 2013.

• [6] S. A. Faroz. Assessment and Prognosis of Corroding Reinforced Concrete Structures through Bayesian Inference. PhD thesis, Indian

Institute of Technology Bombay, Mumbai, India, 2017.

• [7] S. A. Faroz and S. Ghosh. Bayesian integration of NDT with corrosion model for service-life predictions. In Proceedings of IABMAS 2018,

Melbourne, Australia, 2018.

[8] https://civildigital.com/movable-bridges-special- types-ofmovable-bridges-photos/ - movable bridge

[9] https://en.wikipedia.org/wiki/Arch_bridge -arch bridge

[10] https://en.wikipedia.org/wiki/Bridge - bridges

[11] http://www.historyofbridges.com/facts-about- bridges/types-ofbridges/ - car traffic

[12] Andrew Gastineau, Tyler Johnson, Arturo Schultz "Bridge Health Monitoring and Inspections" –A Survey of Methods September 2009.