Water Level Monitoring System At Railway Bridges To Prevent Accidents

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Abstract- *In railway system, safety and reliability are highly required factors. Despite of safety measures, every year at least one major accident is recorded. The aim of this project is to present a handy module consisting of sensors and micro-systems which are used to detect faults which cause accidents. So, there is a need to design a system which will continuously monitor water level of bridges. It is useful for public safety and reduction in human losses. Such system will help in disaster management. Ultra-Sonic sensor monitors the water level of bridge. LCD (Liquid crystal display), and Buzzer are output devices which continuously inform the status and occurrence of fault.*

Keywords- Ultra Sonic Sensor, LCD and Buzzer

I. INTRODUCTION

Transport plays a vital role because it enables the act of buying and selling goods and services between persons which is a pre-requisite for the development of a Nation. Transportation has throughout history been a spur to expansion as better transport leads to more trade [1]. The stage in an economic cycle has always been dependent on increasing the capacity and rationality of transport. But the infrastructure and operation of transport has a great effect on the land and is the largest drainer of energy, making transport sustainability and safety a major issue.

Rail accidents are one of the major issues till the present day. Despite of safety measures, every year at least one major accident is recorded [1]. The aim of this project is to present a handy module consisting of sensors and micro-systems which are used to detect faults which cause accidents. The causes of accidents are categorized into different modules which include anti-collision, track detection, Bridge collision. Bridges may get collapsed or tilted due to flooding or some concrete problem, natural calamities. So, there is a need to design a system which will continuously monitor water level of bridges [2]. It is useful for public safety and reduction in human losses. Such system will help in disaster management. Water level sensor monitors the water level of bridge.

Water Level Gauge is the existing method of water level monitoring system. Water level at the identified railway bridges are required to be regularly monitored so as to take appropriate action as and when the water level reaches the threshold limit in order to remotely monitor the water level, water level measuring instrument(WLMI) along with intelligent Field device (IFD) can be installed that communicates with the WLMI and transmit the water level data to a central server so that water level can be monitored from anywhere over internet browser and to SMS alert based on various threshold limits[3]. The data can also be transmitted to track management system (TMS) etc, as per defined frequency. This system eliminates round the clock manual observation and monitoring. One such device has been installed and successfully tried on old Yamuna bridge in Delhi division of Northern Railway.

II. TRACK MANAGEMENT SYSTEM

Here in this paper the components used are ultrasonic sensor, Arduino UNO, LCD display. Water Monitoring System has ultrasonic sensor and it is used to detect the level of the water. The level of the water can be measured by means of centimetre. The processor process the data from the level of water and send it to the Arduino and display the level using LCD display.

Ultrasonic sensor detects the level of water and displays the level on the LCD. When the detected level is indicated as "FULL" the buzzer will produce sound[4]. This project saves time and money. Helps in preventing accidents that occur at railway bridges. The input to the Arduino is ultrasonic sensor. Water level will be detected by ultrasonic sensor. The outputs are buzzer and LCD.

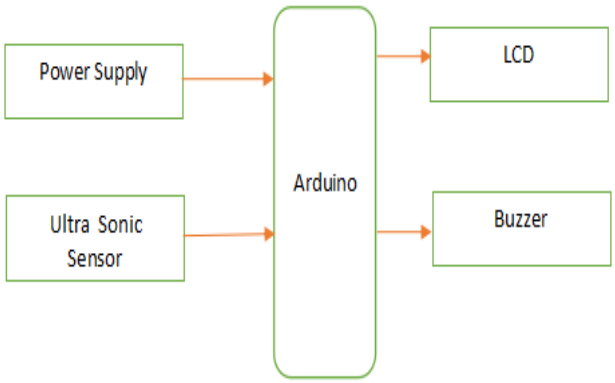


Figure.1. water level measuring instrument (WLMI) along with intelligent Field device (IFD)

Figure 1 shows, Arduino is open source software. Arduino UNO is a micro-controller, ATmega328P contain in it. It has 14 digital i/o pins and 6 analog input pin, a 16 MHz quartz crystal, a USB connection, a power jack and a reset button. Simply connect to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Embedded C program is used for coding.

Ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver [5]. The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second)

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals[6]. Liquid crystals do not emit light directly. LCD's are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock [7]. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger element.

III. DESCRIPTION OF THE PROJECT

Every electrical and electronic device that we use in our day-to-day life will require a power supply. In general, we use an AC supply of 230V 50Hz, but this power has to be changed into the required form with required values or voltage range for providing power supply to different types of devices. There are various types of power electronic converters such as step-down converter, step-up converter, voltage stabilizer, AC to DC converter, DC to DC converter, DC to AC converter, and so on. For example, consider the microcontrollers that are used frequently for developing many embedded systems-based projects and kits used in real-time applications [8]. These microcontrollers require a 5V DC supply, so the AC 230V needs to be converted into 5V DC using the step-down converter in their power supply circuit. Power supply circuit, the name itself indicates that this circuit is used to supply the power to other electrical and electronic circuits or devices. There are different types of power supply circuits based on the power they are used to provide for devices. For example, the micro-controller-based circuits, usually the 5V DC regulated power supply circuits, are used, which can be designed using different techniques for converting the available 230V AC power to 5V DC power. Generally, the converters with output voltage less than the input voltage are called as step-down converters.

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Son alert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits, which varied the pitch of the sound or pulsed the sound on and off.

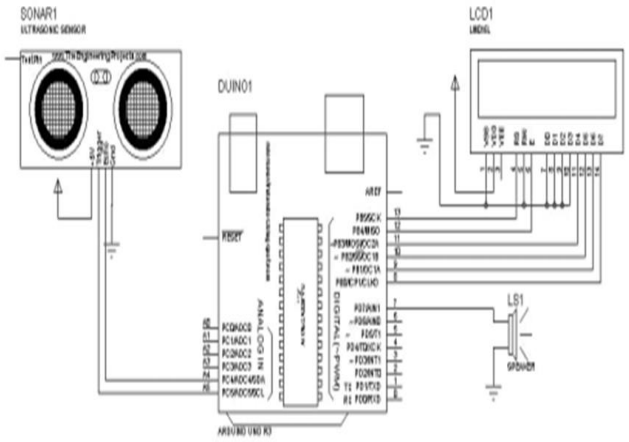
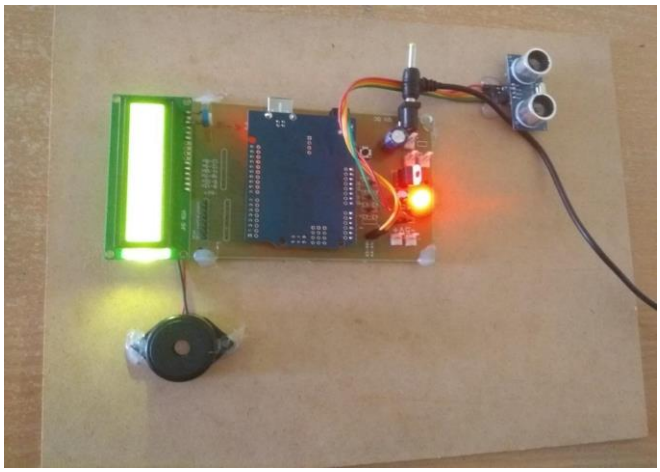


Figure 2. Schematic Diagram

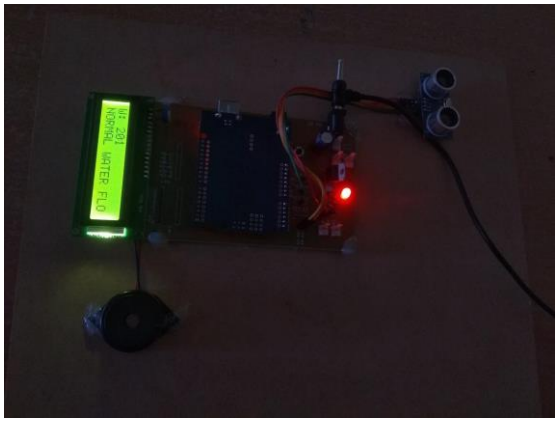
In this paper, we are going to make a water level monitoring system at railway bridges which uses the ultrasonic sensor monitor the level of water. We have used Arduino UNO as the heart of the circuit. All the hardware required such as are ultrasonic sensor, Buzzer, LED, LCD display are connected to the Arduino UNO by using the GPIO pins present on the Arduino UNO board. LCD display shows HIGH level whenever the water is full. The buzzer connected to Arduino also sets "ON". The microcontroller collects the data and displays on the LCD display.

In this will use Arduino UNO with AtmegaP328 microcontroller as heart of the circuit. ATmega328P has 28 pins. The Power requirement of LPC2148 Microcontroller is 5VDC and VSS ground. In this project, we have microcontroller which collects the data and displays it on to the LCD display.Firstly, connect all the components to the Arduino UNO and turn on the UNO board by using 5V supply given from USB or LAN port. Finally open the Arduino IDE and dump the Arduino code on to the Arduino UNO. To check the output switch on the power supply. Now place an object in front of sensor until the ultrasonic sensor senses the level as HIGH. The buzzer starts buzzing and the LED glows indicating the water is full. As the buzzer and LED are set high the output of Arduino Uno also becomes high. This process continues till the water level is controlled.

IV. RESULTS



Outlook of the water level



Output of Normal Water Level

V. CONCLUSION

This project has achieved the main objectives. Moreover, this project involved designing and development of automatic water level control system had exposed to the better way of software and hardware architecture that blends together for the interfacing purposes. The system employs the use of advance sensing technology to detect the water level. The project has been successfully implemented and tested. It gave us more confidence that we will be able to put it in practice, whatever the theoretical knowledge we gained during the course of study till now. It really persuades us to do more and more perhaps better way in future.

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