ISSN 2321 3361 © 2017 IJESC

Research Article Volume 7 Issue No.10

Ultrasonic Sensor using Arduino

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Abstract:
Internet is communication between human to human. Advancement in internet has let few things monitored by humans and to some extend control them. In this system, humans play a very essential role. It is humans those read information, analyse the information and then perform the necessary action. The action may be either informing someone or controlling something. All these actions are performed by humans. So the internet is known as internet of people or internet of humans. But, what if a technology in which a thing or a device can communicate with other devices? What if one thing can device another device! The system deals with the environmental issues like temperature, relative humidity, with sensors and sends the information to the web page and then plot the sensor data as graphical statistics.

Keywords: IoT, ultrasonic sensing, Arduino Uno, height measurement.

I. INTRODUCTION AND MOTIVATION:

IoT is a technology in which one connected thing can communicate with other connected things. The technology is not only used to communicate one thing to another, but to get the data, analyse it and perform some actions based on the analysis. Here the intervention of humans is very less as the communication us between connected things had grown. These things along with sensors are connected with internet. Here, the sensors play a major role. The whole system actually relies on sensors and also their data. The second important part of the system is the cloud. Huge number of connected things is huge number of sensors and their sensed data. These sensed data are to be stored for analysis and for record purpose. This is where the cloud is used. Should be monitored constantly. The proposed system is motivated by these points.

II. LITERATURE SURVEY:

Among all environmental parameters, measuring distance in the surrounding is very essential and critical parameter. There are many places that need real time distance to be monitored.

III. METHODALOGY

A.System architecture

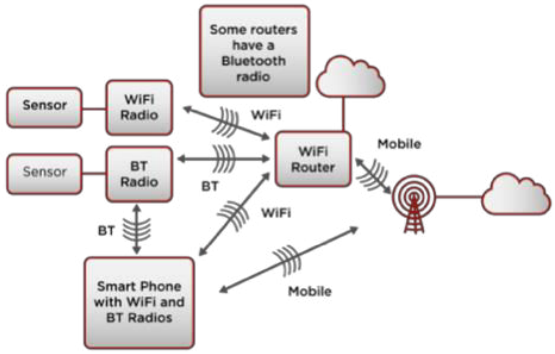

Figure. 1. System architecture

This system is a connection of height sensor, Arduino UNO board along with a bread board and jumper wires. The system can be further expanded by using „n" numbers of temperature of an area. The entire system uses a three tier architecture which consists of sensor module, communication module and cloud module. Sensor module consists of height sensor, situated at some fixed location, senses the height. The sensed temperature will be in analog signal format. This analogue signal is sent to Arduino which converts it into digital signal format. This communication module consists of a Wi-Fi shield. The digital signal is sent to the cloud by using this Wi-Fi shield. The cloud module used in this system is the open source cloud.The data received by the sensor is represented on the cloud in graphical representation.

A. Hardware and software

Due to new innovation in the recent years, there are plenty of sensors and embedded systems available for various purposes. The hardware chosen for this project is based on their availability, sensing capability and the available platforms to develop it. The processing board selected for the project is Arduino Uno. It is a microcontroller board based on ATmega328P. The board has 14 digital input-output pins and 6 analog inputs. The Arduino Uno board has a 16MHz quartz crystal, a USB connection for communication with computer and a power jack. To power the board, connect it to a computer using the USB cable or an AC-to-DC adapter or a battery. **arduino and ultrasonic sensor** is shown above to measure the distance. In circuit connections Ultrasonic sensor module's "trigger" and "echo" pins are directly connected to pin 18(A4) and 19(A5) of arduino. A 16x2 LCD is connected with arduino in 4-bit mode. Control pin RS, RW and En are directly connected to arduino pin 2, GND and 3. And data pin D4-D7 is connected to 4, 5, 6 and 7 of arduino. First of all we need to trigger the ultrasonic sensor module to transmit signal by using arduino and then wait for receive ECHO. Arduino reads the time between triggering and Received ECHO. We know that speed of sound is around 340m/s. so we can calculate distance by using

given formula:
Distance= (travel time/2) * speed of sound
Where speed of sound around 340m per second.
A 16x2 LCD is used for displaying distance.

To connect the system with internet, Wi-Fi module used is ESP8266. ESP8266 is a low cost Wi-Fi module with full TCP/IP stack. The Wi-Fi module has five pins for the connections. It has 64K memory for instructions and 96K memory for data. It requires 3.3V DC current to function. The IDE used for the project is Arduino IDE. It is a cross-platform application for software development. It supports C and C++ languages. It is a code editor that features syntax highlighting, brace matching, etc. It has one click mechanism to compile and load programs to an Arduino board. The cloud used for the project is www.thingspeak.com. This is an open source cloud platform for Internet of Things. It has eight channels in it for uploading data. To secure the data, an API key is given to each and every thing connected to the cloud. The sensed data is shown in a graphical presentation on the cloud. It has features of displaying it as public or private. The data uploaded on this cloud is after every 15 seconds.

B. Experimental setup:
The experimental setup is made by connecting the devices to the computer via USB cables, jumper wires and also by a bread board. First all the connections are made and then, Arduino Uno board is connected to the computer. The Wi-Fi module has about five pins for the connection. To connect the module to Arduino UNO, first connect the Tx pin of Wi-Fi module to the Tx3 pin on Arduino Uno. For these type of connections female-to-male connecting jumper wires. The Rx pin of Wi-Fi module is connected to the Rx2 pin of Arduino UNO. The GND of Wi-Fi module is connected to the GND of an Arduino. Now using the two female-to-male jumper wires, one connected to the Vcc and other to the CHPD pin of Wi-Fi module, are connected to a bread board. These connections on bread board are in vertical line. Now,the male-to-male jumper wire is used for the connection. This wire is connected in the same vertical line as previous connections were connected. The other end of wire is connected to +3V pin of the Arduino Uno.

Figure.2. Ultrasonic sensor
The ultrasonic sensor is a four pin device, PIN1- VCC or +5V; PIN2-TRIGGER; PIN3- ECHO; PIN4- GROUND. Trigger pin is where we give trigger to tell the sensor to measure the distance. Echo is output pin where we get the distance in the form of width of pulse. The echo pin here is connected to controller as an external interrupt source. So to get the width of the signal output, the echo pin of sensor is connected to INT0 (interrupt 0) or PD2.

„AT+CWLAP". This command list all the available access points in the range of Wi-Fi module. The last command will be „AT+CWJAP="SSID", "Password" ". This command is used to join a particular access point. Now the two pins connected to Wi-Fi module and Arduino should be changed. Now compile and execute the code. The figure shows the live temperature which is sensed by the sensor in a graphical presentation. Out of the eight channels present on cloud, the said system uses only one of the channels for monitoring

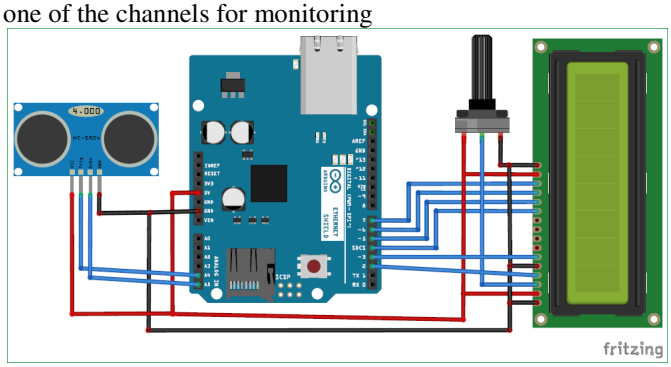

Figure.3. Connection after executing the commands

IV. RESULT

The result of the system figured below.

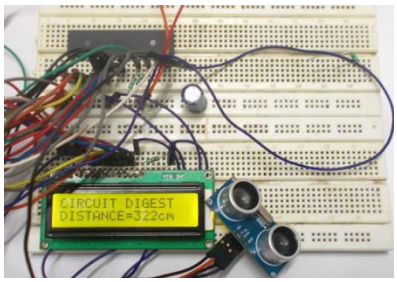

Figure.4. Actual image of the system.

V. CONCLUSION AND FUTURE SCOPE:

The paper presented here is based on the project work carried by us. This project is an implementation of Internet of Things. The said project is able to sense and measures the distance remotely. The proposed use of Internet of Things will help the researchers in the field to come up with solutions that are inexpensive and more reliable. The project can be further expanded to higher range. The distance around the center point can be measured in 360` this becomes helpful for many reasons.

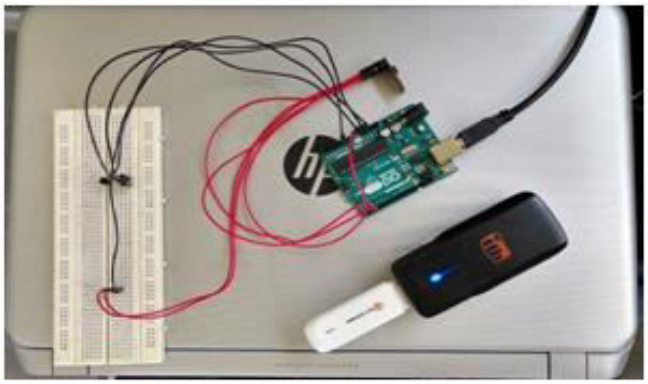

Figure.5. Hardware and sensor connections.

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