Low Cost Experimental set up for Real Time Temperature, Humidity Monitoring through WSN

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Abstract:
Wireless Sensor Network has emerged as a most efficient power tool and low cost solution for the real time temperature, humidity monitoring from widely spread locations. Wireless Sensor Networks has also been widely used by military, healthcare monitoring systems and the manmade/ natural disasters and many other applications. During the past few years, different cities in India, has made remarkable progress in developing new industrial areas with growing population and traffic as well. Such a growth in new industrial establishments has opened up growing opportunities for the citizens, which results a significant increase in the temperature along with pollution level. This paper presents low cost experimental setup for real time temperature, humidity monitoring using WSN (Arduino based).

Keywords: Wireless Sensor Network (WSN), Temperature, Humidity monitoring, Arduino.

I. INTRODUCTION

During the past few years, Wireless Sensor Network (WSN) has been proved a low cost solution for the critical environmental problems. These problems have been affecting the quality of human life as such. Today, the latest ICT enabled technologies have made the life very easy and comfortable in the age of great industrialization. It is a matter of pride that the latest technologies are very much within the reach of a common man. The other side of this growth is very hazardous and a threat to mankind and environment too. Due to the rapid and intense growth of industrial development, vehicular traffic and high rate of migration of the population to the urban areas along with high levels of power energy consumptions lead to higher rate of increase in air pollution all around resulting increase in Temperature. Another reason of the increase of temperature is deforestation, the burning of fossil fuels and forest fire increases the level of carbon dioxide in the atmosphere. Carbon dioxide is what is called a greenhouse gas; it behaves like the glass of a greenhouse and lifts the temperature. A lot a manual work and processing is involved to generate some relevant information of temperature, humidity and pollution. Although various web sites are available for providing this information which may or may not be that accurate. But if scientist or any citizen would like to the temperature of some experimental site or any particular site which may on the mountains then this WSN based solution is extremely useful. A cloud based wireless sensor network has emerged as a ray of hope to provide solution to these problems. e.g. temperature monitoring using IEEE 802.15.4/802.11 [1]. Community sensor networks [2]. Developments like “Sensor-Internet Share and Search” [4] and “People - Centric Urban Sensing networks” [5] are great examples of advancement in this area.

II. OBJECTIVES

The objectives of this paper is to set up experiment for temperature, humidity monitoring using WSN (Arduino)

III. WIRELESS SENSOR NETWORK

The details of the wireless sensor network are given below:

- A sensor network consists of multiple nodes or detection stations called sensor nodes, each of which is small, lightweight and portable. Every sensor node is equipped with transducer, microcomputer, and transmitter and power source. The transducer generates electrical signals based on sensed physical effects and phenomena. The microcomputer processes and stores the sensor output and transmits the data to the coordinating station.

- These nodes can monitor sense and collect information of different environment locations and various monitoring objects [3]. This is a solution based on the low-cost and low-power. Using a wireless sensor networks, information such temperature, humidity, light, noise, presence of combustible gases (such as CO2, CO, CH4, O2, NH3, SH2, NO2, and many more) covered by the network can easily be collected, dealt with and analysed on real time basis.

- Sensor network communication framework for real time application: A wireless sensor network system includes sensor nodes, gateways, databases and a monitoring server. Sensor nodes are fitted with microcontroller of low processing capacity. Then data collected from sensors from the field is transmitted to its cluster head, through which it is further transmitted to the cloud and pollution monitoring station.

IV. METHODOLOGY

The methodology of this experimental set up is given below: This paper is going to present an experimental set up of Wireless sensor network for the real time temperature, humidity monitoring with details of the coding as well.

- Experimental Setup: The Audrino platform was used for the setup with energy efficient WSN. In this experiment, the Arduino board with firmware v.0.9 was used and windows compatible software IDE (Integrated Development Environment) 1.6.5 was installed in the system. Program was written for the different sensors such as
temperature, humidity with Wi-Fi access point connectivity with cloud. The following are the steps done for coding/program and in order to run the sensor board successfully, whose snapshots are given for more clarity.

- **Step 1:** To run the IDE (Integrated Development Environment) as administrator the first time it is started. Then accessed to folder \%APPDATA\%\Arduino15. The IDE core file Arduino.h contains the majority of the Arduino defines, constants, and macros, which in turn also includes several other files. Lily Arduino board program was selected. Snap shot is given in figure 1.

![Figure 1. Snap Shot of the Program vs constants](image1)

Step 2. Lily Arduino Board selection for USB. Snap shot is given in figure 2.

![Figure 2. Snap Shot of the board selection.](image2)

Step 2. To verify the program with the board and selection for the Wi-Fi access point in order to get connected to the cloud things speak [10]. Figure 3 depicts the Wi-Fi settings.

![Figure 3. Snap Shot of the program using Wi-Fi selection](image3)

Step 3. Upload the program firmware w.r.t the board is given figure 4.

![Figure 4. Snap Shot of the final Program.](image4)

Just see everything is Ok and it is working after running the program. Until now WSN is working with USB. Now take USB out and attach a battery and solar panel, ready for the field. Image taken of the board is given figure 5.

![Figure 5. Boarded used with solar panel.](image5)

Step 5. Check that data is being sent to the cloud on real time bases. During this program it has been taken into consideration that every after one minute data is being sent to the cloud. Finally checked the cloud [10] with graphs presented in figure 6 and 7.

![Figure 6: Real time Temperature](image6)

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**Figure 7: Real time Temperature**

The real time graphs taken from the cloud for the temperature shown in figure 7 and humidity status is shown in figure 8.

![Figure 8. Real time humidity](image7)

**V. CONCLUSION**

Using low cost experimental setup for wireless sensor network, it is possible to do the real time temperature, humidity monitoring connected with cloud through Wi-Fi, so that results are available to the citizens. It also becomes easy to visualise and analyse the data available online and remotely. Once the information is available online, then decisions could be taken by the citizens. The main advantage of this solution is to have low cost solution for effective temperature, humidity monitoring using WSN.

**VI. REFERENCES:**


[7]. https://www.arduino.cc/

[8]. http://forum.arduino.cc/


VII ACKNOWLEDGEMENTS

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