

Sensor-based assessment of temperature and humidity for patient care applications

Dr. L. Oliveira¹, Dr. R. Pereira¹, Dr. F. Santos¹, Dr. T. Carvalho^{1*}

¹ Department of Clinical Medicine and Public Health, University of São Paulo, São Paulo, Brazil

ABSTRACT

Temperature and humidity are common factors of environment. Humidity is a measure of water vapor present in air. The level of temperature and humidity in air affects various physical, chemical, and biological processes. The measurement of these parameters could be effectively employed in agriculture and horticulture. An optimum level of temperature and humidity is required for better growth of plants and so, when these parameters are known, it would be easier to predict the most appropriate level of water to be irrigated according to the weather and climate. The technology can be implemented by using arduino, I2C module, LCD display, and a DHT11 sensor. The DHT11 sensor senses the changes in temperature and humidity observed in the environment. This technology is more reliable and more stable. The response is fast with outstanding quality. The wired network can be replaced by using a sensor for measurement of temperature as well as humid content more accurately and without hazardous problems.

Keywords: Arduino, DHT11 sensor, LCD display

INTRODUCTION

The Internet facilities offer many opportunities by which several embedded systems can be made to interact with the environment. This kind of technological developments in present world may take the place of electronic circuits. The Internet of Things (IoT) can be used to access any data from any part of the world in wireless manner. In the present world, many developments such as fiber optic sensors are used for the measurement of temperature and humidity. Similar work can be achieved as follows. SMS facility can also be used to alert the user [1]. The other use can be made to attend staff by alarming system [2]. In case of emergency, the system of temperature and humidity measurement system fails if the attender is away from monitoring process [3]. The person in charge can take responsibility for sending values of temperature [4]. An "Alert SMS" can be received when temperature is deviated from optimum value [5]. The remote monitoring of health is estimated together with maintenance systems [6]. the automation of greenhouse

environment control has a major scope in upcoming technological development [10]. The technology of temperature and humidity measurement has an outcome that gives value of temperature and humidity out of range using Arduino and DHT11.

DHT11 TEMPERATURE AND HUMIDITY SENSOR

These DHT11 sensors are very cheap offering higher performance. It can measure the temperature up to the range of 50 degree Celsius with the accuracy of plus or minus 2 degrees; and the range of humidity it could measure is from 20 to 80% with 5% accuracy. The operating voltage ranges between 3 to 5 volts. The sensor contains a humidity sensing component, thermistor, and an IC at the other end of the sensor. A moisture holding substrate is placed between the two electrodes of humidity sensing component. Hence if humidity changes, the conductivity of the substrate changes or resistance between electrodes changes. These changes can be accessed by an IC to

make it read by a microcontroller. On the other side, for measuring temperature, thermistor can be used. It is usually called as a variable resistor where the resistance changes when temperature changes. This thermistor usually have negative temperature coefficient, whose resistance decreases when temperature increases.

CIRCUIT CONFIGURATION

The circuit design of DHT11 sensor interfacing with arduino is discussed here.

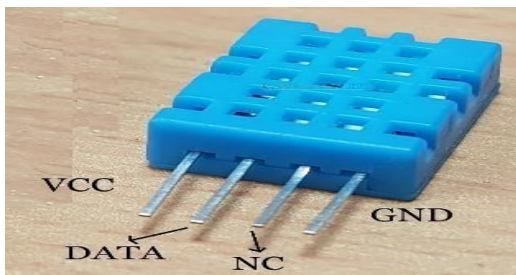


Fig. 1: Pin Configuration of DHT11.

The sensor consists of 4 pins namely Vcc, data pin, NC and ground. The data pin is connected to pin number 11 of arduino. The LCD display is used to show to show the result. The pins 4 and 5 of arduino are connected to pins 4 and 6 of LCD. These pins 4 and 6 are called control pins. The data pins (pins 11 to 14) are plugged with pins 0,1,2,3 of LCD. The necessary code to let the program run is uploaded to arduino.

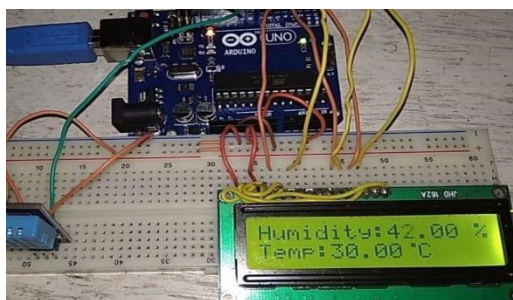


Fig. 2: Circuit Configuration.

WORKING METHODOLOGY

The process may be held up by connecting Arduino UNO and DHT1 sensor. The uploaded program in the arduino will take care of measuring the data of change in temperature and humidity and the results are to be displayed on the LCD screen.



Fig. 3: Working Methodology.

The above figure shows the setup of a mini weather station, where the DHT11 sensor is placed at the roof of building. The test for the increase in temperature and humidity can be provoked by introducing a matchstick burning near to the sensor. It is clear that, due to this, the temperature and humidity around the sensor will be increased. Due to the change in temperature, the value recorded in the LCD display is increased. This gives the obvious outcome of temperature and humidity measurement.

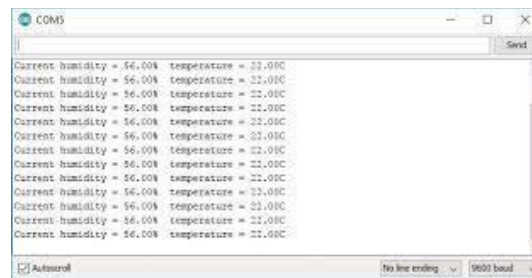


Fig. 4: Result on Arduino Screen.

CONCLUSION

This methodology can be deployed for medical, meteorological, and pharmaceutical purposes. It is clear that, the wired network can be replaced by using a sensor for measurement of temperature and humidity more accurately and without hazardous problems. In the field of agriculture and horticulture, this methodology places a vital role. An appropriate level of temperature and humidity ensures the correct level of water which is to be irrigated and this ensures their progressive growth. As a next step of development, an auto irrigation system which responds with the data of

temperature and humidity in an agricultural field can be introduced with the help of soil sensors, by employing IoT mechanisms.



Fig. 5: DHT11 Sensor in Agricultural Field.



Fig. 6: Result on LCD Display.

REFERENCES

1. Aziz N.H.A., Muhamad W.N.W., Wahab N.A., et al. Real time monitoring critical parameters in tissue culture growth room with SMS alert system. In Intelligent Systems, Modelling and Simulation (ISMS), 2010 International Conference. 339-343p, 2010.
2. Parrish E., Hickey T. A Temperature Monitoring System for Use on Normal Newborn Infants. Instrumentation and Measurement, IEEE Transactions. Vol. 21, 59-60p, 1972.
3. Ruiz-Garcia L., Barreiro P., Robla J. Performance of ZigBee-based wireless sensor nodes for real-time monitoring of fruit logistics. Journal of Food Engineering. Vol. 87, 405-415p, 2008.
4. Zarka N., Al-Houshi I., Akhkobek M. Temperature control via SMS. In Information and Communication Technologies. ICTTA'06. 2nd, 2006, 2678-2683p.
5. Megalingam R.K., Radhakrishnan V., Unnikrishnan D.K.M., et al. Autonomous Smart Server Guard for advanced safety measure using wireless mobile technology. In Mechanical and Electrical Technology (ICMET), 2010 2nd International Conference. 654-658p, 2010.
6. Brown S.J. Remote health monitoring and maintenance system. ed: Google Patents, 2001.
7. <http://www.ardumotive.com/iot-wifi-tempandhumidity.html>
8. Chen W.T., et al. Novel gaseous phase sensor implemented with under loaded RF resonator for sensor-embedded passive chip less RFIDs. In IEEE Transducers 2013, Barcelona, Spain, June 16 – 20, 2013.
9. AT Commands interface V8.6 Wave COM 2000.
10. Guanghui T., Changying L. DNCS-A New Scheme for the Automation of Greenhouse Environment Control. Transactions of the Chinese Society of Agriculture Engineering. Vol. 3, 2002.