Asian Journal of Applied Science and Technology (AJAST)
(Open Access Quarterly International Journal) Volume 2, Issue 2, Pages 474-480, April-June 2018

Iot Based Smart Agricultural Monitoring System

Dr.G.Rajakumar[1], M.Saroja Sankari[2], D.Shunmugapriya[3] and S.P.Uma Maheswari[4]

[1]*Professor, Department of ECE, Francis Xavier Engineering College, Tirunelveli, India.*
[2,3,4]*Students, Department of ECE, Francis Xavier Engineering College, Tirunelveli, India.*

Article Received: 29 January 2018 *Article Accepted: 26 February 2018* *Article Published: 18 April 2018*

ABSTRACT

:Agriculture is the unquestionably the largest livelihood provider in India. With rising population, there is a need for increased for increasing agricultural production. In order to support greater production in farms, the requirement of the amount of fresh water used in irrigation also rises. Currently, agriculture accounts 83% of the total water Consumption in India. Unplanned use of water inadvertently result in wastage of water. So making Automatic Plant Irrigation System using Arduino, which automatically provides water to plants and keep updated by sending message. In this Plant watering System, the Soil Moisture Sensor checks the moisture level in the soil and if moisture level is low then Arduino switches on a water pump to provide water to the plant. Water pump gets automatically off when system finds enough moisture in the soil. Whenever system switched on or off the pump, a message is sent to the user via IOT module, updating the status of water pump and soil moisture. The water pump and the spray motor are added by using crane concept. This system is very used in Farms, gardens, home etc., This system is completely automated and there is no need for human intervention. Also, the sensor readings are transmitted to a Thing speak channel to generate graphs for analysis.

Keywords: IOT, Arduino, Sensors, Stepper motor, Thing Speak.

1. INTRODUCTION TO AGRICULTURAL MONITORING SYSTEM

Irrigation is a crucial alternative to predominantly monsoon fed Indian agriculture. Due to the possible health risks behind the use of pesticides, the cost of developing new pesticides has risen at an increasingly rapid rate over recent years .Government regulations have become more stringent, slowing the rate of development and in turn increasing the cost of new products. The biggest advantage of pesticides is they are readily available and very easy to use unlike alternative method and other similar methods which can take a long while to plan and often don't have an immediate effect on. The system was studied and developed to configure of the wireless sensor network to assess the temperature, humidity and water level adjustment, and of the sensor node necessary for the optimal farming environment, and of the monitoring management devices to collect and analyze such collected data from sensor node and to store them in the management server and to alert emergency. The collected data provide the information about the various Environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture overcome these problems. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from there sources. Hence this paper deals about developing smart agriculture.

2. LITERATURE REVIEW

Dr.N.Suma, Sandra Rhea Samson, S.Saranya (2017) proposed a paper in which makes use of wireless sensor networks for noting the soil properties and environmental factors continuously. various sensor nodes are deployed at different locations in the farm. Controlling these parameters are through any remote device or internet services and the operations are performed by interfacing sensors, Wi-Fi, camera with microcontroller. This concept is created as a product and given to the farmer's welfare [1].

V.Vinoth Kumar, R.Ramasamy (2017) proposed a paper in which the Microcontroller transmits that information on the internet through a network of IoT in the form of wifi module ESP8266 that is attached to it. This enhances automated irrigation as the water pump can be switched on or off through information given to the controller and it is used to get the chlorophyll content and nitrogen content of the leaf using LDR and Laser [2].

K.Lokesh Krishna, Wasswa Fahad Malende (2017) proposed a paper in which proposed wireless robot is equipped with various sensors for measuring different environmental parameters. The main features of this novel intelligent wireless robot is that it can execute tasks such as moisture sensing, scaring birds and animals, spraying pesticides, moving forward or backward and switching ON/OFF electric motor. The proposed wireless mobile robot has been tested in the fields, readings have been monitored and satisfactory results have been observed, which indicate that this system is very much useful for smart agricultural systems [4].

3. PROPOSED SYSTEM

In the field section, various sensors are deployed in the field like temperature sensor, moisture sensor, ultrasonic sensor and humidity sensor. The data collected from these sensors are connected to the Arduino UNO. In control section, the received data is verified with the threshold values. If moisture level is low then Arduino switches on a water pump to provide water to the plant. Water pump gets automatically off when system finds enough moisture in the soil and a message is sent to the user via IOT module, updating the status of water pump and soil moisture. These factors include attack of pests which can be controlled by spraying the crop with proper pesticides. An irrigation system for efficient water management and spray the pesticides for crops has been proposed. Parameters like moisture, temperature, humidity are measured by using sensors. The water and pesticides are sprayed by using spray motor and motor pump. The ultrasonic sensor is used to monitor the growth of the plants ,one can observe the plants from anytime, anywhere in the webpage via IOT. In present, Thingspeak is added which is a platform with ios to control the arduino that supports hardware platform. Monitoring the plant growth by using ultrasonic sensor and sending the status to the webpage via IOT module. Watering will be done automatically by predefined time delay.

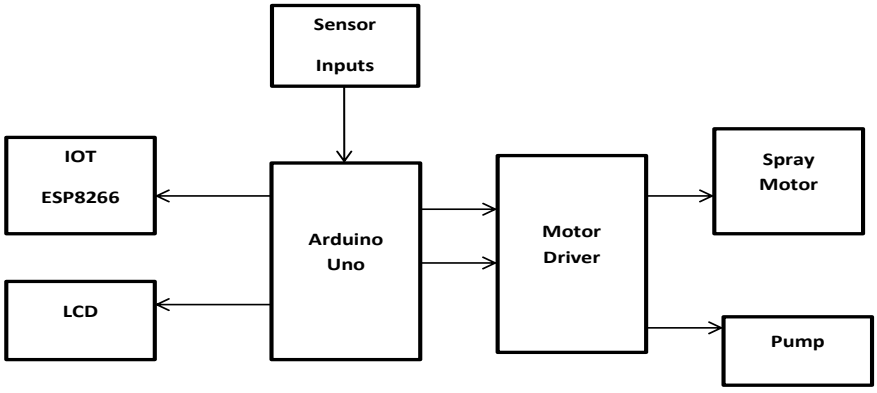

Fig.1 Block Diagram of Proposed System

3. 1. ARDUINO UNO

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P. The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

Fig.2 Arduino UNO

3.2. SENSORS

3.2.1. SOIL MOISTURE SENSOR

Soil Moisture sensor is used to measure the moisture content present in the soil. When the soil moisture value read by the sensor is above the threshold value, low level (0V) will be the digital output and if it is below the threshold level, high level (5V) will be the digital output. The digital pin is used to directly read current soil moisture value to see if it is above threshold or not.

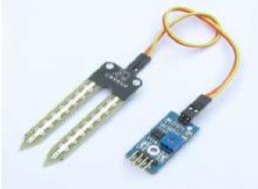

Fig.3 Soil moisture sensor

3.2.2. DHT11 SENSOR

DHT11 sensor is used for measuring temperature and humidity. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air. This sensor is cost effective, provides low power consumption and up-to 20 meter signal transmission is possible.

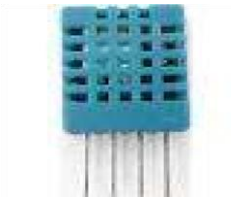

Fig.4 DHT11 sensor

3.2.3. ULTRASONIC SENSOR

The sensing probe element consists of a special wire cable which is capable of accurately sensing the surface level of nearly any fluid, including water, salt water, and oils. The sensor element is electrically insulated and isolated from the liquid into which it is inserted, and will not corrode over time.

Fig.5 Ultrasonic sensor

3. 3. IoT MODULE

The Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies (MEMS) and the Internet. concept may also be referred to as the Internet of Everything. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low.

4. RESULT AND DISCUSSION

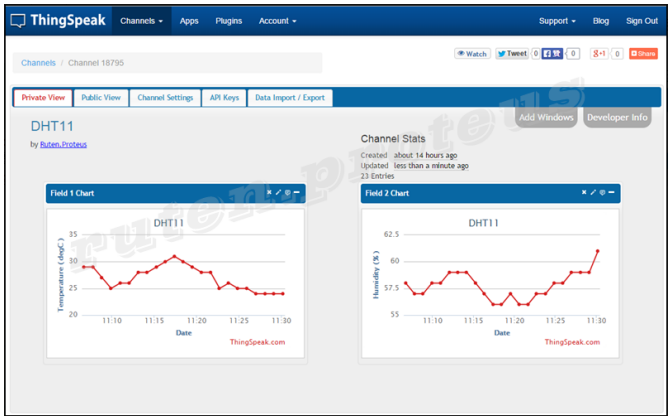

Fig.7 Shows Temperature and Humidity value relative to time

Thus after the signal conditioning process the value of humidity and the temperature of the soil is transmitted through the Wi-Fi module of the proposed irrigation system and then it is received to the user device through the open source IoT server.

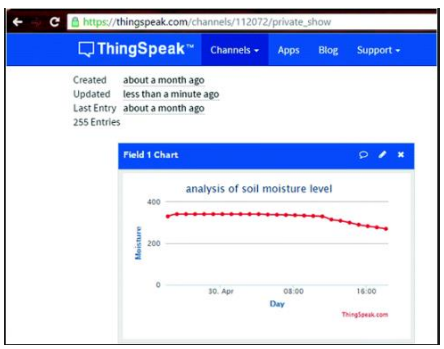

Fig.8 Shows soil moisture level analysed through Thing Speak

Then the real time data of the soil and crops such as temperature, humidity sensor is transmitted. Thus the humidity and the temperature signal is viewed by the user is in relative to the time. Whenever the signal is deviated from the span of reference value of the proposed irrigation system then the corresponding signal is transmitted to the field section by the user. Whenever the soil moisture is below the span of reference value then the signal is transmitted to the user through the Wi-Fi module and the IoT server that signal is received by the user device and the command is sent though the same path and the corrective action is takes place.

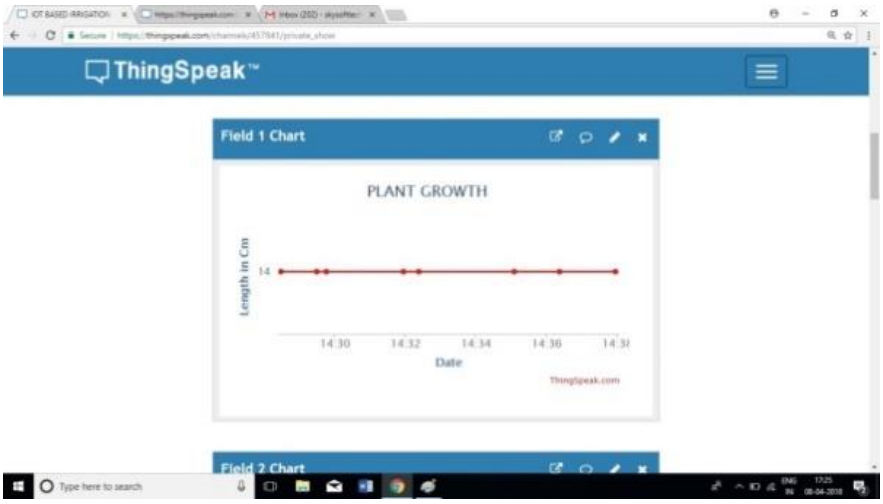

Fig. 9 Shows the height of the plant (in cm) with respect to time

In this output the user can only view the height of the plant. The height value which is calibrated to the corresponding height of the plant in the proposed irrigation system. The Humidity, Temperature, Moisture sensors are displayed in the LCD module which is connected to the arduino UNO. The Ultrasonic sensor which isused to monitor the growth of the plants. The IOT module is connected to the arduino UNO. The pump and the pest sprayer are operated using motor. The stepper motor is used for forward and reverse operations.

5. CONCLUSION AND FUTURE ENHANCEMENT

Thus the system is useful to monitor the parameters for agriculture such as temperature, humidity , moisture, leaf growth, spray the water and pesticides through the motor pump via IOT module. The system reduces the manual work, man power. This set up was carried out using Arduino UNO, Temperature and Humidity sensor, soil moisture sensor, ultrasonic sensor and IoT module. The Thing Speak page can be developed to control the system through the mobile. Damage caused by predators is reduced and also be used to increase the productivity. The system is integrated with ultrasonic sensor to monitor the health of the plants, one can observe their plants anytime, anywhere in the web. In Future, new hardware, like the corn-tending robot, is making strides by pairing Data-collecting software with robotics to fertilize the corn, apply seed cover-crops, And collect information in order to maximize yields and minimize wastes. IoT sensors capable of providing farmers with information about crop yields, pest infestation and soil nutrition are invaluable to production and offer the precise data.

ACKNOWLEDGEMENT

This work was supported in part by Department of Science & Technology (DST), FIST Program at Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India.

REFERENCES

[1] N.Suma, Sandra Rhea Samson, S.Saranya, G.Shanmugapriya, R.Subhashri "IOT Based Smart Agriculture Monitoring System" International Journal on Recent and Innovation Trends in Computing and Communication , Volume: 5 Issue: 2, pages: 177 – 181 .

[2] Muthukumaran. N and Ravi. R, 'Hardware Implementation of Architecture Techniques for Fast Efficient loss less Image Compression System', Wireless Personal Communications, Volume. 90, No. 3, pp. 1291-1315, October 2016, SPRINGER.

[3] Muthukumaran. N and Ravi. R, 'The Performance Analysis of Fast Efficient Lossless Satellite Image Compression and Decompression for Wavelet Based Algorithm', Wireless Personal Communications, Volume. 81, No. 2, pp. 839-859, March 2015, SPRINGER.

[4] V.VinothKumar, R.Ramasamy "Implementation of Iot In Smart Irrigation System Using Arduino Processor" International Journal of Civil Engineering and Technology (IJCIET).

[5] Muthukumaran. N and Ravi. R, 'VLSI Implementations of Compressive Image Acquisition using Block Based Compression Algorithm', The International Arab Journal of Information Technology, vol. 12, no. 4, pp. 333-339, July 2015.

[6] Muthukumaran. N and Ravi. R, 'Simulation Based VLSI Implementation of Fast Efficient Lossless Image Compression System using Simplified Adjusted Binary Code & Golumb Rice Code', World Academy of Science, Engineering and Technology, Volume. 8, No. 9, pp.1603-1606, 2014.

[7] Ruban Kingston. M,Muthukumaran. and N, Ravi. R, 'A Novel Scheme of CMOS VCO Design with reduce number of Transistors using 180nm CAD Tool', International Journal of Applied Engineering Research, Volume. 10, No. 14, pp. 11934-11938, 2015.

[8] Jia Uddin1, S.M. TaslimReza2 "Automated Irrigation System Using Solar Power" 2012 7th International Conference on Electrical and Computer Engineering 228 20-22 December, 2012, Dhaka, Bangladesh.

[9] K.Lokesh Krishna, Wasswa Fahad Malende "Internet of Things Application for implementation of Smart Agriculture System" International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) I-SMAC 2017.

[10] Muthukumaran. N and Ravi. R, 'Design and analysis of VLSI based FELICS Algorithm for lossless Image Compression', International Journal of Advanced Research in Technology, Vol. 2, No. 3, pp. 115-119, March 2012.

[11] Manoj Kumar. B and Muthukumaran. N, 'Design of Low power high Speed CASCADED Double Tail Comparator', International Journal of Advanced Research in Biology Engineering Science and Technology, Vol. 2, No. 4, pp.18-22, June 2016.

[12] N. Muthukumaran, 'Analyzing Throughput of MANET with Reduced Packet Loss', Wireless Personal Communications, Vol. 97, No. 1, pp. 565-578, November 2017, SPRINGER.

[13] P.Venkateswari, E.Jebitha Steffy, Dr. N. Muthukumaran, 'License Plate cognizance by Ocular Character Perception', International Research Journal of Engineering and Technology, Vol. 5, No. 2, pp. 536-542, February 2018.

[14] N. Muthukumaran, Mrs R.Sonya, Dr.Rajashekhara and Chitra V, 'Computation of Optimum ATC Using Generator Participation Factor in Deregulated System', International Journal of Advanced Research Trends in Engineering and Technology, Vol. 4, No. 1, pp. 8-11, January 2017.

[15] Keziah. J, Muthukumaran. N, 'Design of K Band Transmitting Antenna for Harbor Surveillance Radar Application', International Journal on Applications in Electrical and Electronics Engineering, Vol. 2, No. 5, pp. 16-20, May 2016.

[16] Akhil. M.S and Muthukumaran. N, 'Design of Optimizing Adders for Low Power Digital Signal Processing', International Journal of Engineering Research and Applications, Vol. 5, pp. 59-65, March 2014.

[17] Muthukumaran. N and Ravi. R, 'Quad Tree Decomposition based Analysis of Compressed Image Data Communication for Lossy and Lossless using WSN', World Academy of Science, Engineering and Technology, Volume. 8, No. 9, pp. 1543-1549, 2014.

[18] Marvin Mark. M and Muthukumaran. N, 'High Throughput in MANET using relay algorithm and rebroadcast probability', International Journal of Engineering Research and Applications, Vol. 5, pp. 66-71, March 2014.

[19] G. Merlin Suba, Y M Jagadeesh, S Karthik and E Raj Sampath, "Smart Irrigation System Through Wireless Sensor Networks", ARPN Journal of Engineering and Applied Sciences, vol. 10, pp. 1,no. 17, september 2015.

[20] S. Darshna, T.Sangavi, Sheena Mohan, A.Soundharya, SukanyaDesikan, "Smart Irrigation System", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Volume 10, Issue 3, Ver. II (May - Jun.2015), pp 32-36.