International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 05 | May -2020 ISSN: 2582-3930

DESIGN OF SMART DRIP IRRIGATION SYSTEM FOR FARMING

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Abstract -This project proposes a design for system which is using geared up, advantageous and energy operative devices. Use of these components results in overall cost effective, upgradable and vigorous implementation of the system. The commands from the user are handled at raspberry pi using python programming language. Raspberry pi acts a central coordinator and the end devices act as several routers. Low-cost and energy saving drip irrigation system serves as a proof of this concept. The design can be used in big agricultural fields as well as in small lawns by just sending the information to the cloud to water plants. The use of temperature, humidity sensors and solenoid valves make a smart drip irrigation system. Experimental set-up is also verified and described for an automatic drip irrigation system.

***Key Words*:**Raspberry pi, Zigbee, Arduino, Relay, Sensors, Drip Irrigation.

1.INTRODUCTION

In our nation, Agriculture is real fountainhead of livelihood generation to the progressing interest of human society. Irrigation is the activity of providing water to the agricultural land by unreal means for the development of farming. Generally the field gets the water through an essential origin like rain but the extent of water that the area gets through rain is inadequate for the plants to grow. So the goal of irrigation is to incorporate something to provide the essential amount of water and by this farmers can get the appropriate harvest from the agricultural land.

Most of the feasible water resources across the world are merely used for the agricultural purpose. In the approaching years, this demand is likely to rise as a result of increasing population. To meet this requirement, smart drip irrigation system is crucial technique for the conservation of water.

2. PROPOSED SYSTEM

The progress of agriculture depends on a few environmental specifications such as soil temperature, soil moisture, relative humidity, pH of soil, light intensity etc. Instant change in any of these specifications can cause problems like diseases, improper growth of plant, etc. mainly resulting in lesser yield. The proposed system consists of different types of sensing units such as temperature sensor, soil sensor moisture, humidity sensor, light sensor. The monitoring system consists of raspberry pi, zigbee, arduino, relay, water pump.

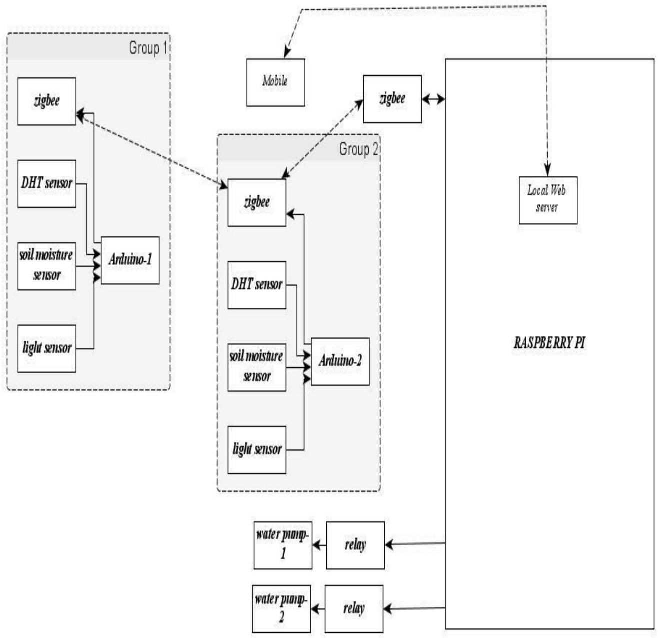


Fig -1: Block diagram of the proposed system

The projected system contains two units i.e. group1 and group2 as shown in the above figure. Every group includes temperature, humidity, soil moisture sensors also as zigbee. The detected knowledge from every group is transmitted to the master node via zigbee. The received knowledge from the master node is hold on at the cloud server.

Soil moisture sensor, temperature sensor are connected to Arduino board. If the soil wet worth is higher than the wet level and wetness is high at the given worth and conjointly if the temperature is high then the water motor are on, whereas if the wet level, humidity, temperature is low the motor are off through the relay. The DHT detector used here is DHT11 detector and light detector used is Light Dependent Resistance (LDR). LDR is employed for dominant light-weight mechanically.

Raspberry Pi is the heart of the existing system. However Raspberry Pi cannot directly drive the relay. It's solely 0V or 3 V. we want 12V to drive electro mechanical relay. In this case we want a driver circuit .The driver circuit takes the low level input and provides the 12V amplitude to drive the relay that operates at 12V .We use relay to turn on Water motor.

All sensing nodes send soil moisture measurements frequently, which is able to help the algorithm taking decisions concerning the necessity for irrigation. When a soil moisture message has a value below the defined threshold, the algorithm will read the values of ambient temperature and humidity so as to make decision whether to irrigate or not.

The cloud is additionally liable for finding the correct moment to prevent the irrigation. For that, whenever all soil moisture sensor of the network assumes a soil moisture value larger or adequate to the defined threshold will specify the tip of the irrigation. When this condition is assured, the cloud sends a message which contains an instruction to prevent the irrigation. The sensed data is transmitted to the master node via zigbee coordinator.

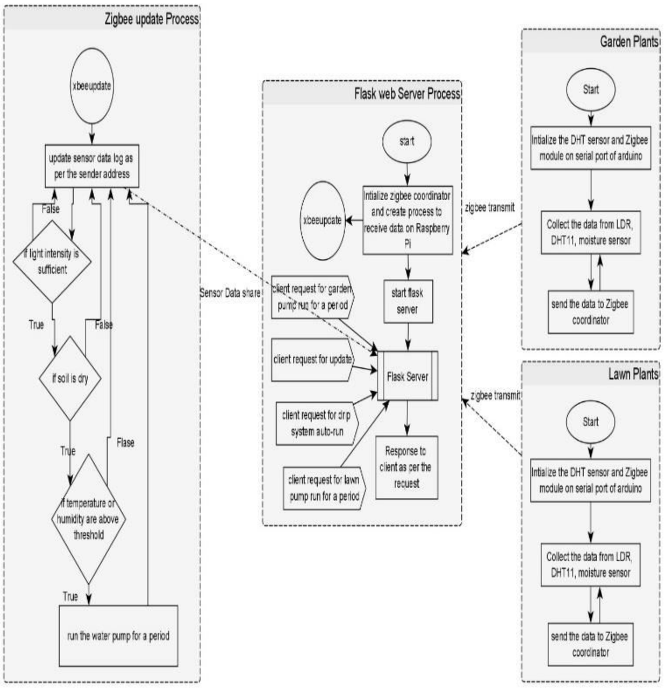


Fig -2: Flowchart of the proposed system

This architecture is meant to supply scalability for network. The irrigation system is optimized so as to supply irrigation efficiency which is able to allow saving water also as improving the crop quality.

3. COMPONENT DESCRIPTION

3.1 Raspberry pi

The raspberry pi is a small single board computer which can been used to teach computer science. The raspberry pi is been used as a computer where external memory can be used and it has four ports where any input devices can be connected. This project uses raspberry pi for easy process and installation.

3.2 Zigbee

ZigBee can be a popular, low-power, wireless mesh network focused at battery-powered gadgets in control and monitoring operations. ZigBee brings low-latency communication. ZigBee chips are frequently integrated with radios and microcontrollers. The ZigBee network layer naturally reinforce star, tree networks and mesh networking. Every network should have one coordinator device. Its low power utilization restricts transmission distances from 10 to 100 meters line-of-sight depending on power output and environmental characteristics.

3.3 Arduino

Arduino is also an open-source hardware and software which sketches and fabricates single-board microcontroller kits for assembling digital devices. It consists of 14 digitalinput/output pins out of which 6 may be used as PWM outputs, 6 analog inputs. It also comprises of 16 MHz ceramic resonator, a USB connection, an ICSP header. It includes nonvolatile storage of 32KB of which 0.5KB is employed by boot loader.

3.4 Sensors

A sensor may be a module whose objective is to determine modifications in its environment and drive the information to other electronics, often a computer processor. Here, we use Light Dependent Resistor for sensing light, DHT11 sensor for sensing temperature and humidity and a soil moisture sensor.

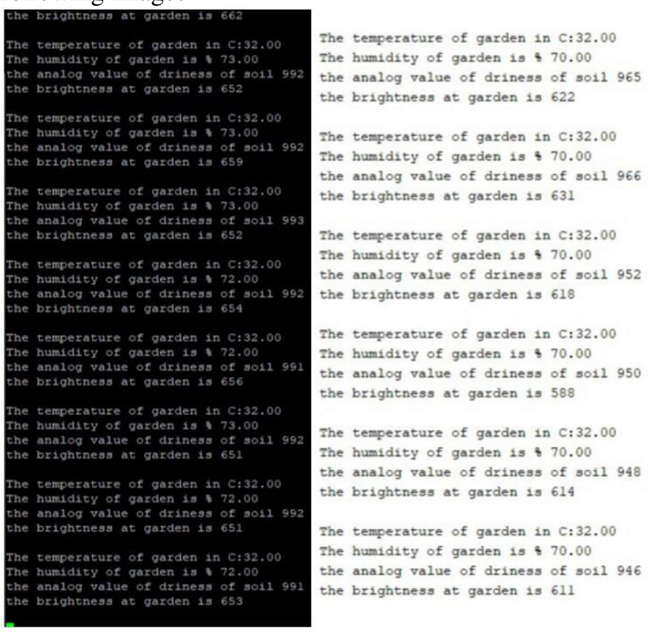
3.5 Relay

A relay may be an electrically operated switch which comprises of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. Since it an electromagnetic switch which allows us to regulate a high voltage electrical circuit by opening and closing contacts in another low voltage circuit. In the Raspberry Pi, the control circuit will be operated by the GPIO pins.

4. RESULTS

As mentioned in the flowchart given, we have used two arduinos. One is for garden plants and other is for lawn plants. The circuit diagram is same for both the arduinos. Initially sensor data log is updated as per sender's address. Arduino measures the condition of soil dryness, light, temperature and humidity.
These measured values are sent to raspberry pi through zigbee coordinator. Raspberry pi is connected to the two motors of the two relays. Based on the sensor conditions, raspberry pi controls the water pump connected to the relay.

The measured and transmitted values are shown in the following images



Fig– 3: Measured and transmitted values near the garden and lawn

Turning on/off the water pump mainly depends on the measured and transmitted values mentioned above. Since we measure the sensor conditions of both the garden and lawn, we have assumed P1 is the pump for garden and P2 is the pump for lawn.

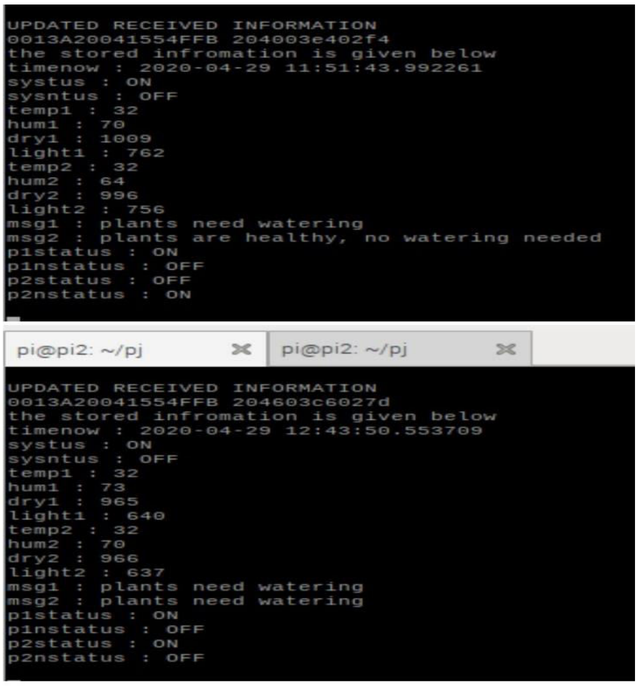


Fig- 4: Image indicating status of the plants based on the sensor conditions

Using flask web framework, a web page is created where buttons are provided to make water pump on or off based on the required conditions. The data that is received by the raspberry pi is sent to the flask web server. The flask web server receives the client request for garden and lawn to pump the water for required period. Depending on the sensor values, the web server responds to the client as per the request.

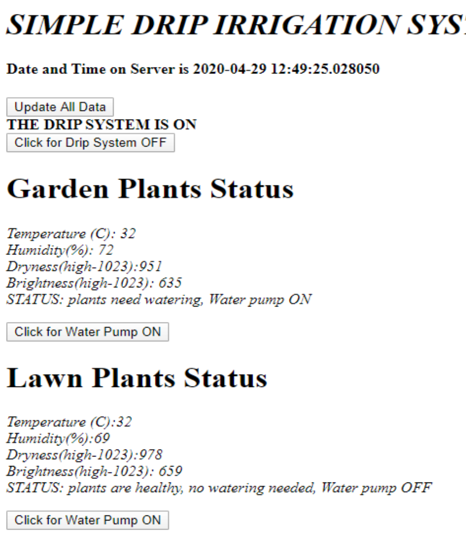


Fig- 5: Web page showing buttons for watering the plants in garden and lawn

4. CONCLUSION AND FUTURE WORK

The smart irrigation system executed is achievable and cost effective for enhancing water resources for irrigation purpose. This system allows cultivation in places with water shortage thereby upgrading sustainability. Conservation of water sources and reducing the use of inorganic fertilizer can be attained with this method. The human involvement is much optimized using smart drip irrigation system. The arduino along with sensors take the readings of water content in the soil and transfers the data to raspberry pi through zigbee. Besides, this architecture uses Raspberry pi which assures many features for cultivating plants in a ideal way. As the system is entirely automated, it does not need absolute attentiveness of farmer and thereby it saves the time. The system doesn't require individuals on duty as it is authentic. Overall this system may be used in a place with lack of water and where human involvement is less. The future of drip irrigation seem to be good. As the need for water conservation increases, applications of drip irrigation should also increase. There are some tasks that should be done and would enhance the system to a more mature state. Moreover, the system may be extended further for outdoor utilization.

REFERENCES

[1] A. Abdullah, S. A. Enazi and I. Damaj, "AgriSys: A smart and ubiquitous controlled-environment agriculture system," 2016 3rd MEC International Conference on Big Data and Smart City (ICBDSC), Muscat, 2016, pp. 1-6.

[2] M. Dinesh and P. Saravanam, “FPGA Based Real Time Monitoring System for Agricultural Field”, International Journal of Electronics and Computer Science Engineering, pp. 1514–1519

[3] I. Singh and M. Bansal, “Monitoring Water Level in Agriculture using Sensor Networks”, International Journal of Soft Computing and Engineering, pp. 202–204, November 2015.

[4] Y. Kim, R. Evans and W. Iversen, “Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network”, IEEE Transactions on Instrumentation and Measurement, pp. 1379–1387.

[5] Aziz, M. Hasan, M. Ismail, M. Mehat and N. Haron, “Remote Monitoring in Agricultural Greenhouse using Wireless Sensor and Short Message Service”, International Journal of Engineering Technology, vol. 9, pp. 1–12.

[6] G. R. Mendez, M. A. Yunus and Dr. S.C. Mukhopadhyay, “A Wi-Fi based Smart Wireless Sensor Network for an Agricultural Environment”, Fifth International Conference on Sensing Technology, pp. 405–410, January 2011.

[7] M. Haefke, S. Mukhopadhyay and H. Ewald, “A Zigbee Based Smart Sensing Platform for Monitoring Environmental Parameters”, IEEE Conference on Instrumentation and Measurement Technology, pp. 1–8..

[8] J. John, V. S. Palaparthy, S. Sarik, M. S. Baghini and G. S. Kasbekar, "Design and implementation of a soil moisture wireless sensor network," 2015 Twenty First National Conference on Communications (NCC), Mumbai, 2015, pp. 1-6.

[9] Krishna S. Nemali, Marc W. van Iersel. An automated system for controlling drought stress and irrigation in potted

plants, ScientiaHorticulturae, pp: 292-297, Vol. 110, no. 3, pp. 292–297, Nov- 2011.

[10] PriyankaRanade, SB Takale, Smart drip irrigation using FPGA based wireless sensor network, International Research Journal of Engineering and Technology (IRJET), Vol. 03, May.2016.

[11] Kansara, K., Zaveri, V., Shah, S., Delwadkar, S., Jani, K. 2015 Sensor Based Automated Irrigation System with IOT In IJCSIT, Vol. 6(6).

[12] SurajNandkishorKothawade, S.M. Furkhan, A. Raoof, K.S. Mhaske, "Efficient water management for greenland using soil moisture sensor", 1st IEEE International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES2016), pp. 1-4, 2017.

[14] ChandankumarSahu, PramiteeBehera, "A Low Cost Smart Irrigation Control System", IEEE Sponsored 2nd International Conference on Electronics and Communication System (ICECS 2015).

[15] SnehaAngal, "Raspberry pi and Arduino Based Automated Irrigation System", International Journal of Science and Research (IJSR), vol. 05 Issue 07, pp. 3, July 2016.