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Research Paper

Internet of things survey on crop field smart irrigation automation using IOT

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Abstract

This paper gives a general survey on Crop Field Smart Irrigation Mechanization utilizing web from claiming things. The paper covers details regarding the basics of Internet of Things and also the importance of Agriculture in a country like India. Internet of Things is fundamentally those intercontinental for everyone electronic units through Internet. By this interconnection the devices work in a synchronous way to achieve common goals. It is an evolving technology in the areas of trade, industry, medical and many applications. Many applications of IoT make use of sensors for detecting and activating gadgets helping in sharing of data. Agriculture is one such trade on which the entire nation is dependent. We in brief review the various techniques which will allow the farmers to grow more of their crops and reduce wastage of water by using sensors and automation of the irrigation system. The irrigation of crop fields depends on the data collected by the soil moisture sensors. The review can also be extended by understanding the way light intensity is controlled in greenhouses and also that the farmers can be able to monitor the field conditions from anywhere. This system is very useful in areas with scarcity of water. This sys is 92% more efficient than the conventional approach.

Keywords: *Display; LCD; LEDs; MoistureSensor; Microcontroller*

1. Introduction

The term "Internet of Things" was introduced in the year 1982 by Kevin Ashton. It includes the concept of flowing of information among the interconnected devices using internet as the mode of transmission. Internet is used as the mode of transmission as the data passing through the internet can be updated and checked easily by connecting directly to the entire world's data. This system of IoT is considered as concerning illustration the world's third wave of the data business after those inventions for machine and the Internet. In the Internet of Things, Each existing electronic gadget could be associated with those Internet What's more should you quit offering on that one other remotely and could trade information for different gadgets. By allowing everything to be interconnected, devices can recognise other devices, can also know the locations, and also can have the ability to sense and control other devices. Valves are controlled by Irrigation system using automated controller allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labour to turn valves [1].The technologies which can be used to achieve the above parameters are IPv6, RFID, Zig Bee, Wi-Fi, EPC, Bluetooth, etc. To increase the accuracy of the measured value and assists in decision making the fuzzy logic scheme is used [2]. Further The main advantage of IoT is its capability of using sensor networks. Sensors networks are rapidly gaining ground in the wireless technology and are proving to be way more efficient than other technology by fusing with the digital and physical world.

2. Description

IoT is the combination of several layers which helps it to differentiate the work done at each layer. All these layers together form the complete structure of the system.

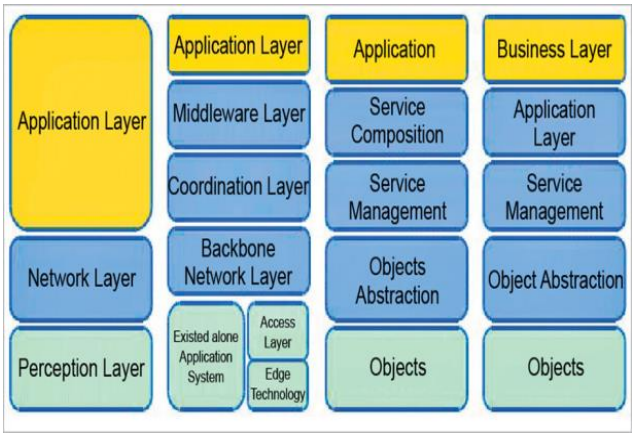


Fig. 1: Different layers in Architecture of IOT

The Perception layer: All kinds of the information identified in the physical world are equipped and collected using this layer. The collected information has all different properties of the object, the conditions of the environment, and also the readings from the RFID and all kinds of sensors including GPS and other equipment. The Network access layer: The two main composition of network

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access layer is the base station node and the network access gateway. After the complete working of perception layer's networking the data is needed to be uploaded and send to the base station node. Then finally the connection with the network transmission layer will be completed by the access gateway The Network transmission layer: The transmission and exchange of information is mainly worked out here. The basis of transmission is provided by this layer. The integration problems in the network layer with different layers and the means of communication, stronger system technology will develop on 5Layer: Support layer focuses on the public intelligent analysis and data storage. It also realizes the information processing and all the intelligent exchanges. The level of security required by this layer is very high and should have strong encryption algorithm and protocols. Also the system should be strong and installed with proper antivirus. The Application Layer: This layer has different security needs for different application environment so the data sharing of this layer creates the problems of data privacy and revelation of information. To overcome this problem, we need to have two aspects that May be the Confirmation and the magic concurrence over those heterogeneous systems.

3. Literature Survey

We all know that food is the basic necessity of one's survival and in India agriculture is the only way to get healthy food. Almost everyone in this country depends upon it for survival. But growing crops for the farmers are becoming tough as the climatic conditions are unpredictable. As a result, a lot many crops are wasting and also due to scarcity of water the farmers are unable to grow crops. To overcome all such problems IoT is been integrated with agriculture to increase the productivity. The main reason for all the problems were the unavailability of the farmers when irrigation is required and also the lack of water resource available with the farmers. These are overcoming due to the fact that IoT uses sensors to do the work. Using sensors will automate the irrigation and also helps the farmers to save water. For automation Soil Moisture sensor has been implemented where soil moisture sensor's terminal is dipped into the soil. The two ends of the sensors transfer electrons from one end to another through soil. The ratio of electrons received determines the quantity of water available in the soil. If the water ratio is below the threshold, then the motor is turned on automatically. Upon receiving higher ratios, the motor is turned off. Waters are used from the reservoirs to irrigate the fields. Due to global warming and periodic rainfall the soil loses its fertility. But at the same time water needs to be saved for all crops to irrigate. Thus Drip Irrigation [3] method is mainly followed by the farmers nowadays. The most important lead of Drip Irrigation [3] is that the water is provided near the roots of the plant. Due to this a large amount of water is being saved. Water deficiency can be dangerous as it mould fungi on the plants. This fungus destroys the plants. So it is necessary that the sensors work properly and sufficient water is supplied to the crops in intervals [6]. It enhances water efficiency too while working on plant's health improvements. In this worth of effort, the framework may be created using the sensors to monitor the field and automate of the irrigation. The further improvements in the system can be done by integrating wireless transmission of sensor data and storing it into the database so that the farmers can know around status with admiration to their phones. The report from the GSM [1] is send through the android mobile [3]. Also using the GSM [1] networks, we can make the farmers to activate or deactivate motor from anywhere just by sending message to the equipped system [1].

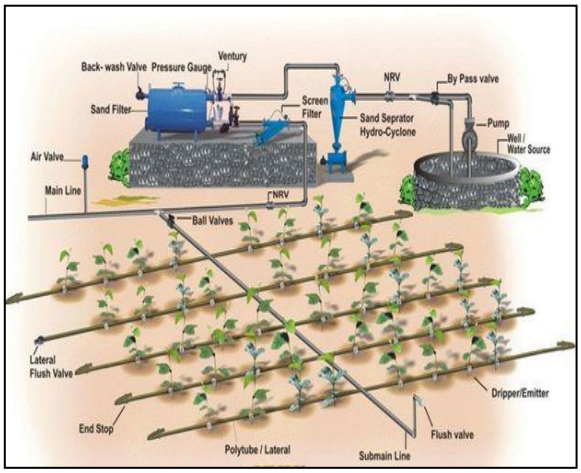


Fig. 2: Automation Irrigation using Water Source

Different Crops requires different quantity of water supply throughout their developing period. Some details for the Seasonal Crops are mentioned as below where water required are in (mm/total growing period):

Bea:	350-450
Maize:	550-850
Sunflower:	550-1050
Citrus:	950-1150
Groundnut:	450-650
Sorghum/millet:	500-750
Cotton:	750-1200
Soybean:	550-800
Melon:	350-600

Details for some Common Crops grown in India are mentioned below where water required are in (mm/total growing period):

Rice:	1000-1100
Wheat:	370-450
Onion:	750-800
Potato:	300-400
Pea:	300-350
Jawar:	650-750
Mustard:	250-300
Oat:	360-400
Barley:	250-300

These data help the system to monitor the growth of particular crop and accordingly activates and deactivates the water supply from the motor based on Soil Moisture Readings. This saves a lot of water resource and benefits the farmers to estimate the growth.

4. Working Principle

Since IoT has been implemented in this system thus this project requires very less human involvement once it is installed. The circuit to be used is depends on soil moisture sensor and PIC microcontroller [2]. After setting up the system it will be able to save 60 percent of water used in irrigation. The designed system can be used in turf grass or small garden plants.

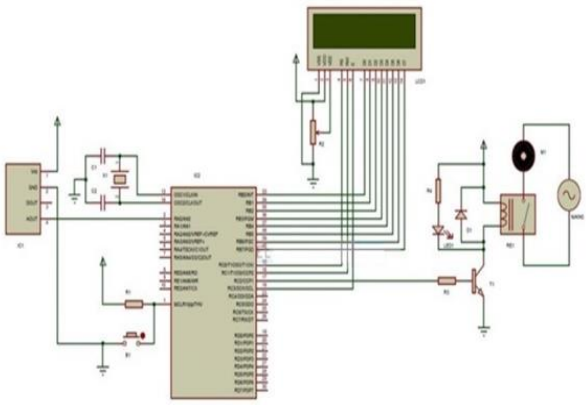


Fig.. 3: Working Model of Automation Irrigation

Soil Moisture

Soil moisture is the most important parameter to consider for this system. The working of the system based on soil moisture content in both on small as well as large scale modelling of agriculture interaction. Crops always depends more on the water moisture available near the roots than the precipitation occurrence. We use soil moisture sensor to accomplish the purpose of getting moisture information which is the key to the system. The Soil moisture sensor has two terminals which can be used to pass electrons using soil moisture as the medium. The ratio of the electrons received defines the moisture content and accordingly the motor is turned on and off for the irrigation.

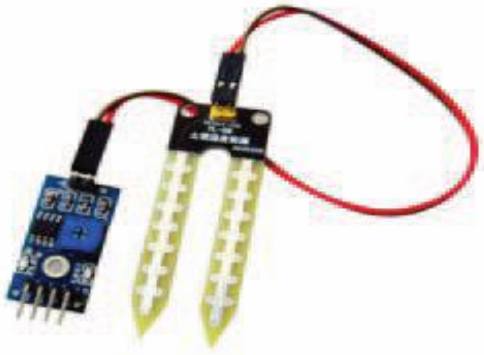


Fig. 4: Actual Soil Moisture Sensor

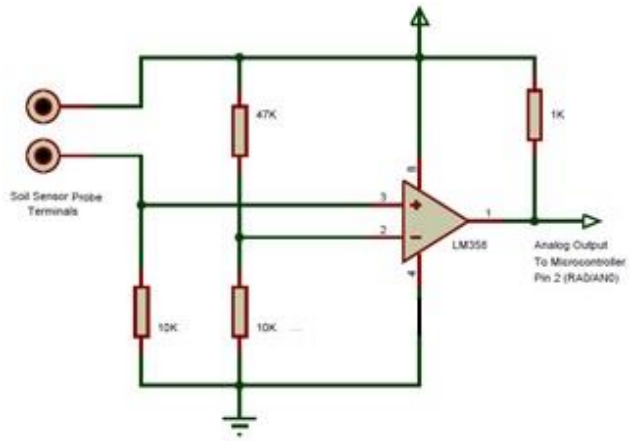


Fig. 5: Implementation of Soil Moisture Sensor

The several other components required for the system to work are mentioned below with their Part no/ Value/ Keyword:

- IC1 – and digital out
- IC2 – PIC 16F877A Microcontroller [2]
- X1 – 12 MHz Crystal Oscillator
- C1 and C2 – 33 pF
- R1 – 4.7 KΩ
- R2 – 10 KΩ Pot
- R3 – 2.2 KΩ
- R4 – 1 KΩ
- B1 – Push Button
- T1 – BC547
- D1 – 1N4007
- RE1 – 12V Relay (JQC-3F)
- LED1 – Red LED
- M1 – Motor
- LCD1 – 16x2 LCD Display

These components are connected together in the simulation tool to give the representation of how the actual system will perform. The working of the circuit starts from the soil moisture sensing the moisture to the motor being switched and message displayed on LCD.

Working of the Circuit

The main scheme of the project is to simulate the working of mechanical irrigation system by using the soil moisture. The working of the circuit is similarly as takes after. Those dirt dampness sensor may be embedded in the soil close to the roots of the plants on account of those dampness substance In establishes may be essential. Then the soil moisture sensors measure the conductivity of the soil by the comparator present in the sensor. We know recognize that the wet soil will a chance to be more conductive over the dry with the goal the voltage from those prongs [3]. Also edge voltage need aid compared and the yield may be helter just when the dirt state will be secondary. The solution from the sensor is passed on to the PIC microcontroller [2] by the analogue input pin (2 – RA0).The working of the microcontroller [2] is to ceaselessly screen those information pin. When the value is above the threshold then the LCD says the same message and that the motor is off. The point when those yield starting with the soil dampness may be secondary it executes that the soil dampness will be lesquerella. Thus the LCD displays the same message and the connected base of the transistor is high. Turning the transistor on will help the relay coil to get energized and turns on the motor. The message is displayed that the motor has been turned on. The LED is also turned on to indicate the same. Again with simultaneous monitoring of the soil moisture input if the threshold value is reached then the output will be low. As a result, the motor and LED will be switched off and the message is displayed on the LCD. Turning off the motor at correct time is important as to save water and also that too wet soil is also dangerous for the crops. This process works 24x7 to support the farmers and also to save water resources. Proper checking of the system is initiated at regular intervals where the quality of soil is checked as well as the threshold value for each crop.

5. Conclusion

The project concludes that the irrigation becomes much easy for the farmers by using this system of integrating IoT with irrigation. The system is accurate and also practical with the same soil sample. This idea can be applied and implemented in the agricultural difficulties. The essential requisitions would for the little farmers or those gardeners who don't have enough period should water their harvests. This system also take care for the farmers who are very wasteful of water throughout the irrigation. The project can be extended to greenhouses [4] monitoring of the temperature and making the system work automatically to modify the changes in

the temperature [4]. This all principles can be extended to create a fully automated agricultural area joining this framework with downpour water collecting an immense quantity of water Holdings could an opportunity with make saved. Also the future scope covers the utility of the farmers to activate and deactivate the Motor from anywhere using the GSM [1] networks technology installed in the system. Also the notifications for each actions performed by the system will be send to the farmers using the same methodology.

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