Internet of Things Based Smart Irrigation System

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Abstract

The Internet of Things (IoT) is a shared network of devices or things that can communicate with one another through the Internet. By 2050, the Internet of Things will have played a big part in farming manufacturing, which will be able to feed 9.6 billion people on the planet. Smart Agriculture aids in the reduction of costs, the efficient use of compost, and hence the increase of agricultural output. In this paper, a system is created to monitor agricultural fields and manage the irrigation system utilising sensors (soil moisture, temperature, humidity, and float level sensor). Wireless connection is used to send data from sensors to the Web attendant database. The data in the server database is stored in JavaScript Object Notation Format. The engine will switch on/off automatically based on the water level in the land while it is raining.

***Key Words:** Irrigation, IOT*

I.   INTRODUCTION

India is one of 13 nations on the earth with limited water resources; as a result of inefficient water management, our country is at risk of overheating. This article proposes precise cultivation irrigation systems based on IoT knowledge, and focuses on the hardware architecture, network architecture, and software process control of the precision irrigation system, in order to efficiently reduce the impact of insufficient water possessions on India's wealth, from a modern undeveloped cultivation and organisation viewpoint, according to the basic principles of Internet, with sensor technology. Early tests revealed that this organisation is well-balanced and practical.

Agriculture, being the primary source of food grains and other basic resources, is regarded as the cornerstone of life for human species. It is critical to the country's economic development. It also provides a huge number of service opportunities to the general public. Growth in the agriculture sector is critical for the country's financial status to improve. Unfortunately, many farmers continue to adopt inefficient, underdeveloped methods, resulting in low crop and fruit yields. However, everywhere mechanisation has been adopted and humans have been substituted by automated machines, the yield has increased. As a result, contemporary science and expertise must be applied to the agriculture industry in order to increase productivity. The majority of the papers discuss the usage of wireless sensor systems to gather data from various types of sensors and send it to a central server through wireless protocol. The acquired data gives in-depth information on a variety of ecological aspects, which aids in the system's monitoring. Monitoring environmental conditions is not a sufficient or complete approach for increasing agricultural productivity. There are a number of additional elements that have a significant impact on efficiency. These variables include insect and pest attacks, which may be avoided by

treating the crop with the appropriate insecticides and pesticides. Second, assailants of natural flora and animals, as well as flora and fauna as the crop matures. Thefts are also a possibility while the crop is nearing harvest. Farmers confront difficulties in storing produced crops even after harvesting. So, in order to provide answers to all of these issues, it is necessary to design an integrated system that would account for all aspects impacting production at each step, such as farming, harvesting, and post-harvest storage. As a result, this study suggests a structure that may be used to track field data and plan field activities while maintaining flexibility. The goal of the study is to use automation and IoT technology to make agriculture smarter.

a)   Purpose

➢ Simple and easy to install and configure.

➢ Reduction energy and possessions, so that it can be utilize in proper way and amount.

➢ Farmers would be able to spread the right amount of water at the correct time by automating farm or nursery irrigation.

➢ Avoiding irrigation at the incorrect time of day, decrease runoff from overwatering drenched soils which will improve crop performance.

➢ Automated irrigation system uses valves to turn speed ON and OFF. Motors can be automatic easily by by means of controllers and no need of labour to turn motor ON and OFF.

➢ It is exact method for irrigation and a valuable tool for accurate soil dampness control in highly specialized greenhouse vegetable production.

➢ It is occasion saving, the human error abolition in adjusting obtainable soil moisture levels.

b)   Product Scope

We are discussion about between everything to the Internet; there is an inconceivable amount of business opportunities involved. Industry, logistics and health are a number of of the sector in which IoT is concerned Because of this we can connect small objects or devices to the Internet, a whole new model will come out creating a big collision in people's lives. Intelligently linked appliance to the Internet, health related strategy collect important data and wearable are just an example, and they are all trending. They will undoubtedly deliver and improve our quality of life by making invention easier, more practical, smarter, and more dependable. However, much work has to be done in order for IoT to thrive and actually emerge: standards must be implemented to ensure interoperability, security and confidentiality must be implemented to safeguard people' data, and scalability must be achievable. Without these characteristics, IoT would fail to achieve anything, and we will just have little "islands" of IoT that do not communicate with one another, which is not the Internet of Things.
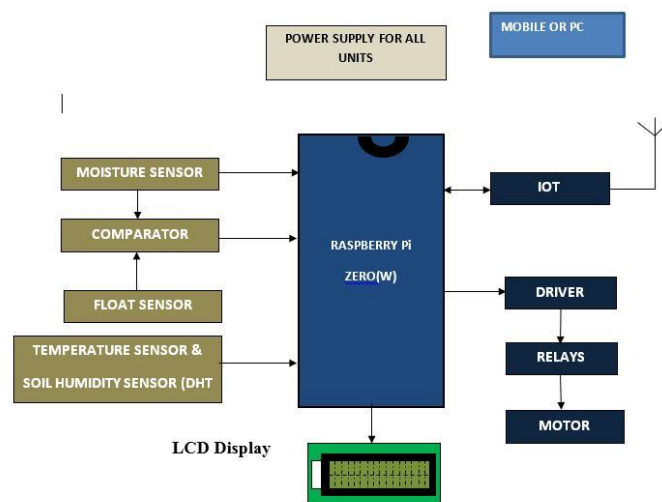
II.   SYSTEM DESIGN

Fig 1 Block diagram

Conservatory-based contemporary agriculture enterprises are a current requirement in every aspect of Indian agriculture. The moisture and warmth of plants are strictly prohibited in this knowledge. Due to the ever-changing nature of the scenario, these variables may vary from place to place in a big farmhouse, making it extremely impossible to maintain consistency in all areas manually. It is recommended that a machine handset handle the irrigation system for the majority of the time, which may provide the facilities of maintaining regular environmental conditions. The Android Software Development Kit provides the tools and request Programmable boundaries need to begin mounting Java-based programmes on the Android platform. Mobile phones have nearly become an intrinsic part of human existence, providing a variety of human requirements. As a solution for irrigation control, this application makes advantage of the General Packet Radio Service function of a mobile phone. The user is notified about the precise pasture status by the Global Organization for Mobile Communiqué. The information is accepted in the form of SMS on the customer's request.

a)   Pump

The pump is a submersible water pump, connotation that it must be totally inundated in a water reservoir in order to pump water. Therefore, for this scheme, you will need to leave out a bowl or any method for a reservoir next to the plant at all times.

b)   DHT Sensor

The DHT11 temp/hum sensory is a standard sensor that does not need to be in any particular location, besides being in the same environment as your plant. Since warmth and dampness do not vary very much within a 5 ft radius, it's okay to just go away the sensor plugged into the RPI and not right next to the plant.

c)   Soil Moisture Sensor

The soil dampness sensor is a normal moisture antenna that outputs a electrical energy when wet, and none when dry. You can adjust the sensitivity of the sensor with the potentiometer located on the sensor.

III.   HARDWARE DESCRIPTION

Our system consists of

❖   Raspberry pi

❖   LCD display

❖   Relay & Pump motors

❖   Temperature Sensor & Humidity Sensor (DHT 11)

❖   Moisture Sensor

❖   Float Level Sensor

a)   Power Supply

Power provides is a orientation to a foundation of electrical power. A machine or organization that provisions electrical or other types of power to an production load or group of many is called a power supply unit or PSU. The term is most usually applied to electrical power provisions, less often to automatic ones, and rarely to others.

Powers supplies for electronic devices can be generally alienated into linear and switches power provisions. The linear supply is a comparatively simple intends that becomes more and more immense and heavy for high current strategy; voltage regulation in a linear supply can result in low efficiency. A switched mode provide of the same ranking as a linear supply will be smaller, is usually more efficient, but will be more complex.

b)   Soil Moisture sensor (YL-69):

The water content of the soil is measured using a soil dampness sensor. It makes advantage of the properties of the soil's electrical conflict. The link between intentional possessions and soil wetness is calibrated, and it fluctuates based on environmental conditions including temperature, soil type, and electric conductivity. It is used to detect moisture in the field and send it to the Raspberry Pi in order to plan the operation of turning on and off the water pump.

The soil dampness module is most sensitive to ambient wetness and is commonly used to detect the soil's humidity level.

Module to reach the doorstep value is set in the soil dampness, DO port output towering when the soil dampness exceeds a set threshold value,   the module D0 output low.

❖   The digital output D0 can be associated straight with the microcontroller to detect high and low by the microcontroller to sense soil humidity.

❖   The digital outputs DO shop relay component can straight drive the signal module, which can form a soil moisture alarm apparatus.

❖   Analog manufacture AO and AD component connected through the AD converter, you can get more accurate standards of soil humidity.

c)   Float Sensor (Level Sensor)

Potentiometer

A potentiometer is a manually adjustable resistor. The way this device works is relatively simple. One incurable of the potentiometer is associated to a power source. Another is enthusiastic up to ground a point with no

voltage or confrontation and which serves as a neutral situation point , while the third terminal runs across a strip of resistive material. This resistive strip usually has a low fighting at one end; its confrontation gradually increases to a maximum resistance at the other end. The third incurable acts as a link between the power supply and the user's position, and is commonly accessed through a knob or lever. The user may manually raise or reduce resistance by adjusting the position of the third incurable along the resistive strip. A potentiometer may determine how much current flows across a circuit by calculating confrontation. The maximal resistance of the strip renders the potentiometer ineffective when used to regulate current.
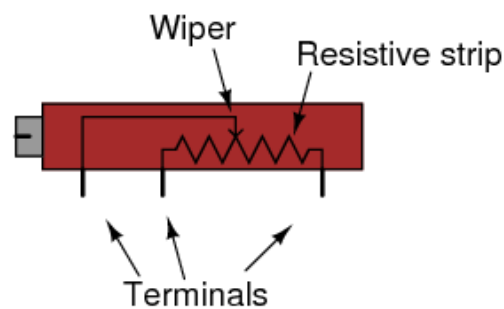

Fig 2 Potentiometer construction

d)   Raspberry Pi Zero Wireless (W)

February 2017, the Pi Zero W has all the functionality of the innovative Pi Zero but with added connectivity, consisting of:

❖   802.11 b/g/n wireless LAN

❖   Bluetooth 4.1

❖   Bluetooth Low Energy (BLE)

Like the Pi Zero, it also has:

❖   1GHz, single-core CPU

❖   512MB RAM

❖   Mini HDMI and USB On-The-Go ports

❖   Micro USB power

❖   HAT-compatible 40-pin header

❖   Composite video and reset headers

❖   CSI camera connector

The Raspberry Pi is a series of tiny single-board computers created by the Raspberry Pi Foundation in the United Kingdom to support the teaching of fundamental computer science in schools and underdeveloped nations. [3] [4][5] The initial model was significantly more popular than expected,[6] selling for purposes such as robotics outside of its designated market. The Raspberry Pi does not come with any peripherals, such as keyboards, mouse, or cases. Despite this, certain trims have been included in a number of official and unofficial packages.
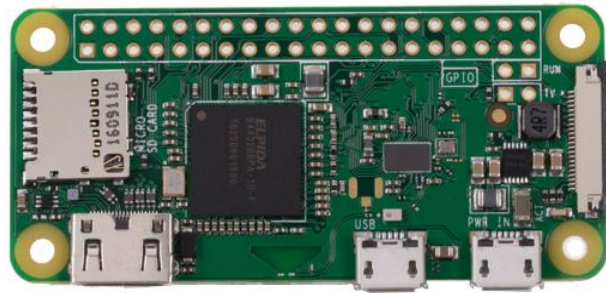
Fig 3 Raspberry pi diagram

e) **Relay Driver**

A relay is an electromagnetic switch which is practical if you want to use a low energy circuit to switch on and off a light bulb or anything else associated to the 220v mains supply.

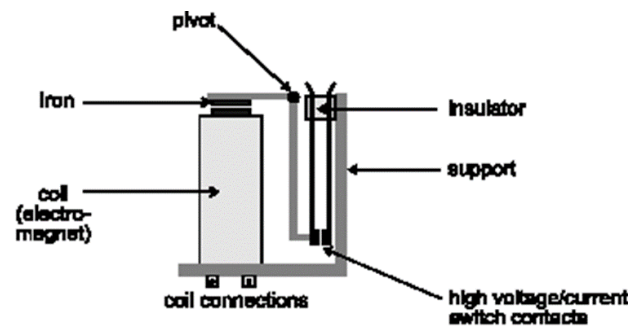The illustration below show a typical relay with "normally open" contacts

Fig 4 Relay Driver circuit

IV. CONCLUSION

Wireless announcement is achieved once the sensors are successfully interfaced with the Raspberry Pi. All of the explanations and testing show that this project is a full answer to the irrigation difficulties in the field. Implementing such a system in the field can help to increase agricultural yields while also assisting in the effective use of water resources, reducing waste.

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