International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 04 | Apr -2017 www.irjet.net p-ISSN: 2395-0072

Connecting Smart Agriculture to Internet through Wireless Sensor

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Abstract - The integration of traditional methodology with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Internet of Things based device which is capable of analyzing the sensed information and then transmitting it to the user. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields i.e. crop, soil, water level, water pressure, motor related operation purpose. This paper is oriented to accentuate the methods to solve such problems like identification of crop is suitable for which soil. Level of water in soil, pressure of water etc. In this project, mentioned sensors and electronic devices are integrated using Python scripts. Agriculture sector being the backbone of the Indian economy deserves security. Security not in terms of resources only but also agricultural products needs security and protection at very initial stage.

Key Words: Internet of Things (IOT), Security, Raspberry Pi, dc motor, Relay, soil moisture ,PIR ,temperature sensor, humidity sensor, float sensor.

1.INTRODUCTION

Agribusiness assuming a vital part in the economy of most countries, agrarian generation has been encountering the consistent change of its procedures and methods. Progresses in implanted gadgets, nearby remote availability, and endeavors in creating correspondence conventions and equipment for interconnecting systems to IP (Internet Protocol) based Internet has prepared for the wide scale arrangement of IoT (Internet-of-Things) network. The goal of this venture is to enhance items quality, and in addition keeping up an economical horticulture, by gathering continuous information from the earth. In this way, there is the requirement for upgrading the assets utilized in the agrarian procedures, mostly in the water system framework. For each product the water required is diverse agreeing there development. The water gave by pump is insufficient to give the measure of water required by the plants for a sound development. Thus, According to the yield give water by checking the dampness level of the harvest. As of now, farming expends around 70% of the crisp water.

This rate can be diminished performing proficient water administration with regards to water system. This venture applies the water effectively, in the opportune place, at the perfect time and in the appropriate sum. It brings wide advantages, for example, water investment funds; cash reserve funds and additionally the change of harvest quality.

1.1 IOT in agriculture environment:

Agriculture provides gainful business and livelihood for majority of community and offers significantly to the national Income Adaptation to climate change is inevitability for all agricultural producers. In India, 83% of farmers accepted agriculture as their main business. 79% of farmers earn a main income from their farming occupation for their house hold and 60% of farmer like farming as their main occupation and overall 73% of farmers have mobile. So, for an accurate result of farming. I wish to use IOT technology in agriculture soil monitoring. I have concentrated a system based on IOT technology for monitoring soil data and get the information about farm related data from anywhere in the world.

1.2 Benefits of IOT in agriculture:

The following are the benefits of IOT applications is:
1. Improvement in the use efficiency of inputs (Soil, Water, etc.)
2. Reduced cost of production
3. Increased profitability
4. Sustainability n agriculture

2. High Level Design Document

In Existed model an Ethernet based system that let users monitor real time switching information of the electrical devices and controlling them through an android apps as well as monitoring the security of their farm in case of unwanted theft of water. It is Raspberry Pi certificated and designed to be hardware, software, and pin compatible with large range of Raspberry Pi shields. Java and Android and Embedded are used in raspberry pi. Our model uses Float sensors to check for the water level indication in tank, soil moisture sensor is used to measure the water level in crop to maintain the use and avoid the unwanted wastage of water, temperature sensor used to check temp of crop Float Sensor is an electrical ON/OFF Switch, which operates automatically when liquid level goes up or down with respect to specified level. Humidity sensor use for water in air, this is helpful for monitor the damage of pipe as well as theft of water and indicates by using buzzer.

Humidity sensor use to detect humidity. DC motor is used to indicate the flow of water to the crop. Also monitor and control the real time tracking and PIR sensor for object detection.MCP3204 for analog to digital conversion.

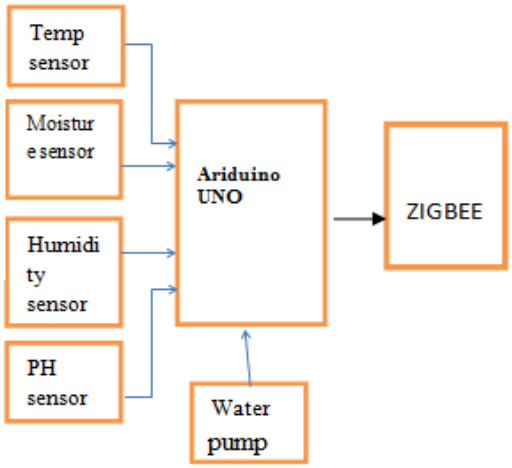

Fig -1: BLOCKS DIAGRAM

2.1 RASPBERRY PI BOARD:

Raspberry Pi is a credit-card-sized single board computer developed in the UK by Raspberry Pi foundation with the intention of stimulating the teaching of basic computer science in schools. It has two models; Model A has 256Mb RAM, one USB port and no network connection. Model B has 5 12Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835 system on a chip which includes an ARMl176JZF -S 700 MHz processor, Video Core IV GPU, and an SD card. The GPU is capable of Blue-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied OpenGL ES2.0 and Open VG libraries.

Fig- 2.1: RASPBERRY PI BOARD

2.2 Power supply:

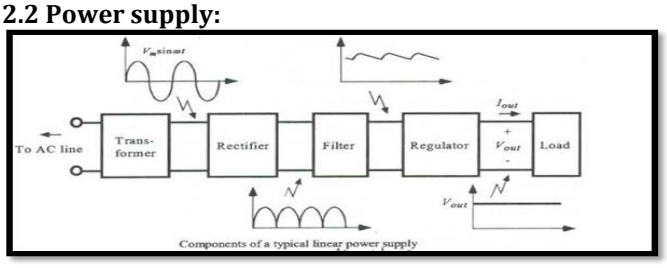

Fig-2.2:POWER SUPPLY

Power supply unit consists of the following units:
a. Step down transformer
b. Rectifier unit
c. Input filter
d. Regulator unit
e. Output filter

2.3 DC motor:

Fig 2.3: DC motor

Electrical motors are everywhere around us. Almost all the electro-mechanical movements we see around us are caused either by an A.C. or a DC motor. Here we will be exploring this kind of motors. This is a device that converts DC electrical energy to a mechanical energy.

2.4 HUMIDITY SENSOR

Humidity is the presence of water in air. The amount of water vapor in air can affect human comfort as well as many manufacturing processes in industries. The presence of water vapor also influences various physical, chemical, and biological.

Fig- 2.4: HUMIDITY SENSOR:

Process Humidity measurement in industries is critical because it may affect the business cost of the product and the health and safety of the personnel. Hence, humidity sensing is very important, especially in the control systems for industrial processes and human comfort.

Controlling or monitoring humidity is of paramount importance in many industrial domestic applications. In semiconductor industry, humidity or moisture levels needs to be properly controlled monitored during wafer processing. In medical applications, humidity control is required for respiratory equipments, sterilizers, incubators, pharmaceutical processing, and biological products. Humidity control is also necessary in chemical gas purification, dryers, ovens, film desiccation, paper and textile production, and food processing. In agriculture, measurement of humidity is important for plantation protection (dew prevention), soil moisture monitoring, etc.

For domestic applications, humidity control is required for living environment in buildings, cooking control for microwave ovens, etc. In all such applications and many others, humidity sensors are employed to provide an indication of the moisture levels in the environment.

2.5 PIR:

Here we should note that every object emits some amount of infrared when heated. Human also emits infrared because of body heat. PIR sensors can detect small amount of variation in infrared. Whenever an object passes through the sensor range, it produces infrared because of the friction between air and object, and get caught by PIR.

The main component of PIR sensor is piezoelectric sensor shown in (rectangular crystal behind the plastic cap). Along with this, some resistors, capacitors and other components used to build PIR sensor. BISS0001 IC takes the input from sensor and does processing to make the output pin HIGH or LOW accordingly. Piezoelectric sensor divide in two halves, when there is no motion, both halves remain in same state, means both senses the same level of infrared. As soon as somebody enters in first half, the infrared level of one half becomes greater than other, and this causes PIRs to react and makes the output pin high. Piezoelectric sensor is covered by a plastic cap, which has array of many Fresnel lens inside. These lenses are curved in such a manner so that sensor can cover a wide range. We have built a very simple Motion detector circuit here. We are using a HC-SR501 PIR Sensor, an LED (which will glow whenever there is a motion in front of the sensor) and resistor. Vcc PIN of PIRs connected to the positive terminal of the 9v battery, GND pin is connected to negative termina1 of battery and Output pin of PIR is connected to LED with a resistor of 220 Ohm. When there is any motion in the range of PIRs, LED will start blinking.

2.6 FLOW CHART:

Each WSN consist of Moisture sensor ,humidity, Temp, Ph sensor water level Sensor which to be interface with PIC18F4520 controller .A data from sensor process by PIC controller and sent to central base station through Zigbee module .All the WSN node are connected to Moisture content in the soil will be measured by the sensor, if the sensor detects the soil as dry this information send to rasberyPi as a base station this data process by rasberyPi and send over GPRS unit to famer mobile application then he takes decision to ON /OFF farm Motor .Both the above information is given to the microcontroller which exchanges data with the server to provide information to the farmer.

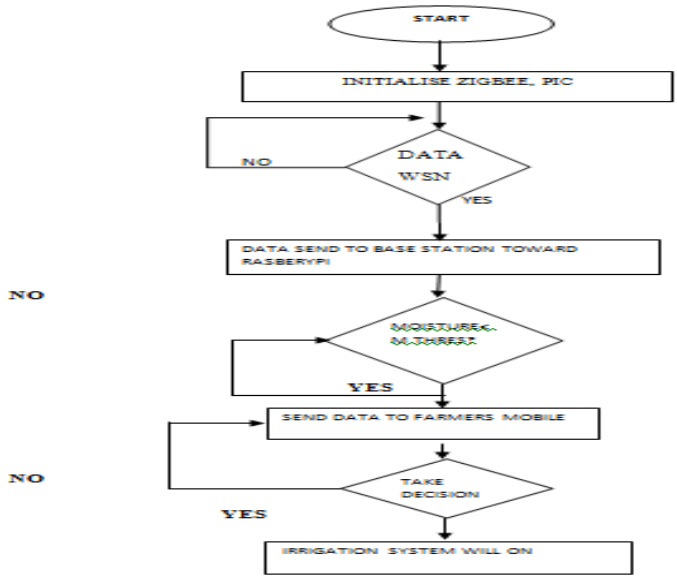

Fig -2.5: FLOW CHART

2.6 Ardino Development Board Details:

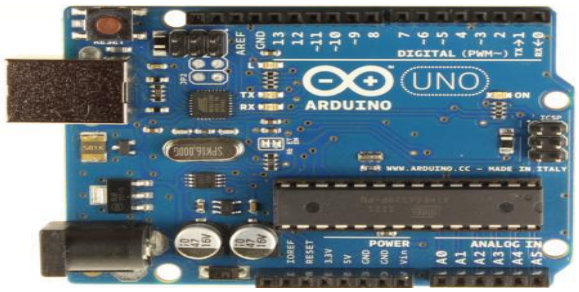

Fig- 2.6: Arduino

The search for a new microcontroller started with the main factor as speed of operation. We looked into different kinds of microcontrollers that are available in today's markets. It is during this search that we came across a totally new generation of controllers that were ready interfaced and armed with loads of basic features. Such controllers are called development boards.

Due to the attractive features of such boards, we started searching a development board that suited our purpose. Arduino is a small microcontroller board with a USB plug to connect to your computer and a number of connection sockets that can be wired up to external electronics, such as motors, relays, light sensors, laser diodes, loudspeakers, microphones, etc. They can either be powered through the USB connection from the computer or from a 9V battery.

They can be controlled from the computer or programmed by the computer and then disconnected and allowed to work independently. Making the display on this entirely new platform requires that we write entirely new code for it. This is one of the most convenient things about using an Arduino. Many microcontroller boards use separate.

2.7 Sensor for soil moisture:

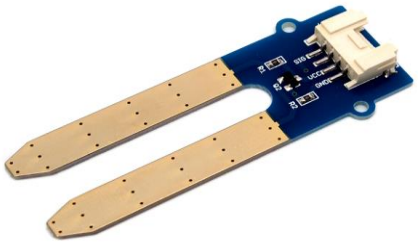

Fig -2.7: soil moisture sensor

The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology. Use the Soil Moisture Sensor to:

• Measure the loss of moisture over time due to evaporation and plant uptake.
• Evaluate optimum soil moisture contents for various species of plants.
• Monitor soil moisture content to control irrigation in greenhouses.
• Enhance your Bottle Biology experiments.

The soil moisture sensor basically used to measure the content of the water in the soil present. According to that the water is dropped to the crop area. The sensor used here is made up of the two probes and the variable resistors. The resistance between two points is further represented as the electrical voltage.

2.8 Temperature sensor:

Here LM35 is used. The LM35 is an IC sensor. The temperature is measured and according to that the output is displayed, which is proportional an in degree Celsius. The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 μA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.

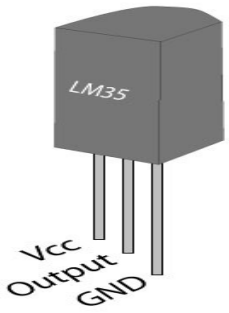

Fig -2.8: Temperature sensor

2.9 Humidity sensor:

It gives the humidity in the atmosphere. This sensor checks the presence of water in air. The amount of water vapor in air can affect the plants growth. The presence of water vapor so influences various physical, chemical, and biological processes.The intelligent humidity sensor is an indirect, calibrated method of measuring soil water. It is an electrical capacitance type sensor, the assembly along with casing of Intelligent Soil humidity sensor is shown in figure 2 which measures the electrical capacitance and transmits to a embedded processor.

Fig-2.9: Humidity sensor

A calibration table is stored within sensor system memory whereby the pre-acquired different standard reference values of capacitances are stored in the memory map (calibration table) for processing by the intelligent humidity sensor embedded processor. That is, the humidity sensor uses the calibration table stored in the memory map of the embedded processor for displaying the calibrated reading of soil water tension. This intelligent humidity sensor can play a significant role in soil moisture measurement technology and hence can be very useful for the precision agriculture. The intelligent humidity sensor is an ideal solution for both agricultural and landscape applications.

3. CONCLUSIONS

All observations and experimental tests proves that project is a complete solution to field activities,irrigation problems, and storage problems using remote controlled robot, smart

irrigation system and a smart warehouse management system respectively.Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

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