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Smart Agriculture Based On Iot By Using Cloud Computing

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ABSTRACT: This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the IOT Technology. This smart agriculture using IOT system is powered by Arguing with Temperature sensor, Moisture sensor, water level sensor, DHT11 Sensor, Ultrasonic sensor, Flame sensor, water motor, buzzer and node MCU. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level. It sends SMS alert on the phone about the levels. Sensors sense the level of water if it goes down, it automatically starts the water pump. If the temperature goes above the level, water motor starts. When any animal reach the agricultural land, the buzzer we attached to the arguing will make the sound alert system. So that the animal will leave the land. Finally all data will be transferred to the IOT cloud system using node MCU module.

1. INTRODUCTION

Agriculture is the unquestionably the largest livelihood provider in India. With rising population, there is a need for increased 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 results in wastage of water. This suggests that there is an urgent need to develop systems that prevent water wastage without imposing pressure on farmers. Over the past 15 years, farmers started using computers and software systems to organize their financial data and keep track of their transactions with third parties and also monitor their crops more effectively.

In the Internet era, where information plays a key role in people's lives, agriculture is rapidly becoming a very data intensive industry where farmers need to collect and evaluate a huge amount of information from a diverse number of devices (eg. Sensors, faming machinery etc.) in order to become more efficient in production and communicating appropriate information.

Generally most of the irrigation systems are manually operated one. These traditional techniques are being is replaced with semi-automated and automated techniques suggested an automated concept of irrigation to use the water efficiently and effectively Automated Drip Irrigation system is implemented either based on the soil humidity or based on the user input via SMS commanding systems. Former method is an isolated irrigation system where the farmer doesn't updated with the irrigation status and later lags in smart utilization of water due to user command without considering the condition of soil.

2. MATERILAS AND METHODS

A. IOT based Smart Irrigation System

Automation of farm activities can transform agricultural domain from being manual and static to intelligent and dynamic leading to higher production with lesser human supervision. This paper proposes an automated irrigation system which monitors and maintains the desired soil moisture content via automatic watering. Microcontroller ATMEGA328P on rduino Uno platform is used to implement the

control unit. The setup uses soil moisture sensors which measure the exact moisture level in soil. This value enables the system to use appropriate quantity of water which avoids over/under irrigation. IOT is used to keep the farmers updated about the status of sprinklers. Information from the sensors is regularly updated on a webpage using GSM-GPRS SIM900A modem through which a farmer can check whether the water sprinklers are ON/OFF at any given time. Also, the sensor readings are transmitted to a Thing speak channel to generate graphs for analysis

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Being an agrarian nation, about 65% of the Indian population depends on agriculture and it accounts for around 22% of the India's GDP [8]. Water management is the most important issue on which the growth of agriculture sector largely depends. Indian agriculture sector is in dire need of investment to meet the expenses. To fuel the capital needs of the agricultural economy and also to ensure that the benefits of growth percolate to bottom of the socio-economic pyramid, farming has to be projected as an avenue of investment for the urban population. The scarcity of available water both in its quantity and quality and the migration of labour from agriculture for various reasons resulted in modernizing and automating farming practices that will pave way for revamping agriculture. Recent scientific advancements have made possible the networking of a wide variety of sensors, independently from any pre-existing infrastructure.

The whole Arduino, Node MCU, Soil Moisture sensor, ultrasonic sensor, PIR sensor, Flame sensor, water level sensor, DHT 11 Sensor. Soil Moisture sensor measures moisture content of the soil. Ultrasonic sensor is used to detect the animal presence in the land.

a) PIR sensor is used to detect the animals which are entered in farmers land. Arduino microcontroller is used to receive input from a variety of sensors and it can control automatically.

b) When soil moisture sensor goes low the water motor will be on and exceeds a defined level, the water motor will off automatically. When the water level is low in the well it will automatically detected by ultrasonic sensor and the details about the water in the well are updated in a webpage.

3. MATERILAS AND METHODS

a) The project is built from easily available and reasonably priced components. Therefore, the cost is reasonable and maintenance is easy.

b) Using this project, the status of crops can be viewed remotely on a smart phone or laptops using the internet. This helps to keep the farmer up to date even when he is away.

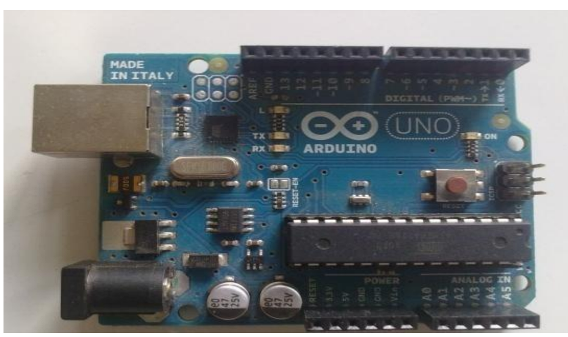

Fig. 3.1. Block Diagram

A. Xarduino Uno And Its

Programming

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer.

Fig. 3.2. Arduino Uno

B. Pin Configuration

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall- wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts..

C. Fire/Flame Sensor Module

Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface can and single-chip can be directly connected to the microcomputer IO port. The detection angle is 60 degrees so the flame spectrum is especially sensitive. The detection angle is 60 degrees so the flame spectrum is especially sensitive.

Specification

- **a)** On-board LM393 voltage comparator chip and infrared sensing probe.
- **b)** Support 5V/3.3V voltage input.
- **c)** On-board signal output indication, output effective signal is high level, and the same time the indicator light up, output signal can directly connect with microcontroller IO.

d) Signal detection sensitivity can be adjusted.

e) Reserved a line voltage compare circuit (P3 is leaded out).

f) PCB size: 30(mm) x15(mm).

Pin Configuration

a) VCC

b) Output

c) Ground

D. pH SENSORS

In the process world, pH is an important parameter to be measured and controlled. The pH of a solution indicates how acidic or basic (alkaline) it is. The pH term translates the values of the hydrogen ion concentration- which ordinarily ranges between about 1 and 10 x-14gram-equivalents per liter - into numbers between 0 and 14.On the pH scale a very acidic solution has a low pH value such as 0, 1, or 2 (which corresponds to a large concentration of hydrogen ions; 10 x 0, 10 x-1, or 10 x-2 gram-equivalents per liter)while a very basic solution has a high pH value, such as12, 13, or 14 which corresponds to a small number of hydro genius (10 x-12, 10 x-13, or 10 x-14 gram equivalents per liter). A neutral solution such as water has a pH of approximately 7.

(i). Typical pH sensor

When immersed in the solution, the reference electrode potential does not change it the changing hydrogen ion concentration. A solution in the reference electrode also makes contact with the sample solution and the measuring electrode through a junction, completing the circuit. Output of the measuring electrode changes with temperature (even though the process remains at a constant pH),so a temperature sensor is necessary to correct for this change in output. This is done in the analyzer or transmitter software.

less susceptible to electrical noise.

The sensor's electrical signal is then displayed. This is commonly done in a 120/240 V ac-powered analyser or in a 24 V dc loop-powered transmitter.

(ii). Interfacing pH Sensors

The pH electrode is essentially a simple single cell battery. The voltage is directly proportional to the hydrogen ion concentration surrounding the electrode. The pH is the logarithm of the hydrogen ion concentration.

3.RESULTS AND DISCUSSIONS

The values obtained through sensors enable the system to switch the sprinkler on and off. A farmer can remotely monitor the irrigation process on the farm. Hence, the system contributed in making a smart farm. Table 2 depicts the readings of the two YL-69 soil moisture sensors taken over a period of one hour. Table depicts readings from two YL-69 soil moisture sensors one of which was inserted in over irrigated soil and the other in soil with initial moisture content 79%. The readings were taken over a period of one hour to observe the rate at which moisture content in soil is reducing when the sprinklers are off.

A. The PIR Sensor

The IR sensor itself is housed in a hermetically sealed metal can to improve noise/temperature/humidity immunity. There is a window made of IR- transmissive material (typically coated silicon since that is very easy to come by) that protects the sensing element. Behind the window are the two balanced sensors.

This image shows the internal schematic. There is actually a JFET inside (a type of transistor) which is very low-noise and buffers the extremely high impedance of the sensors into something a low-cost chip (like the BIS0001) can sense.

B. Lenses

PIR sensors are rather generic and for the most part vary only in price and sensitivity. Most of the real magic happens with the optics. This is a pretty good idea for manufacturing: the PIR sensor and circuitry is fixed and costs a few dollars. The lens costs only a few cents and can change the breadth, range, sensing pattern, very easily.

In the diagram up top, the lens is just a piece of plastic, but that means that the detection area is just two rectangles. Usually we'd like to have a detection area that is much larger. To do that, we use a simple lens (http://adafru.it/aKq) such as those found in a camera they condenses a large area (such as a landscape) into a small one (on film or a CCD sensor). For reasons that will be apparent soon, we would like to make the PIR lenses small and thin and moldable from cheap plastic, even though it may add distortion. For this reason the sensors are actually. The Fresnel lens condenses light, providing a larger range of IR to the sensor.

The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 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

C. Ultrasonic (UV) Sensors or

Ultrasound Sensors

Bats are wonderful creatures. Blind from the eyes and yet a vision so precise that could distinguish between a moth and a broken leaf even when flying at full speed. No doubt the vision is sharper than ours and is much beyond human capabilities of seeing, but is certainly not beyond our understanding. Ultrasonic ranging is the technique used by bats and many other creatures of the animal kingdom for navigational purposes. In a bid to imitate the ways of nature to obtain an edge over everything, we humans have not only understood it but have successfully imitated some of these manifestations and harnessed their potential to the greatest extent.

Ultrasonic sensors are devices that use electrical–mechanical energy transformation, the mechanical energy being in the form of ultrasonic waves, to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a succession of compressions and rarefactions along the direction of wave propagation through the medium. When ultra sonic wave s are incident on an object, diffused reflection of the energy takes place over a wide solid angle which might be as high as 180 degrees. Thus some fraction of the incident energy is reflected back to the transducer in the form of echoes and is detected. The distance to the object (L) can then be calculated through the speed of ultrasonic waves (v) in the medium by the relation

$$L = \frac{v\, t \cos\theta}{2}$$

Where ‘t’ is the time taken by the wave to reach back to the sensor and ‘ ’ is the angle between the horizontal and the path taken as shown in the figure. If the object is in motion, instruments based on Doppler shift are used..

D. Laser Doppler flow measurement

A beam of laser light impinging on a moving particle will be partially scattered with a change in wavelength proportional to the particle's speed (the Doppler effect). A laser Doppler velocimeter (LDV), also called a laser Doppler anemometer (LDA), focuses a laser beam into a small volume in a flowing fluid containing small particles (naturally occurring or induced). The particles scatter the light with a Doppler shift. Analysis of this shifted wavelength can be used to directly, and with great precision, determine the speed of the particle and thus a close approximation of the fluid velocity.

E. Thermocouple

It is a type of temperature sensor, which is made by joining two dissimilar metals at one end. The joined end is referred to as the HOT JUNCTION. The other end of these dissimilar metals is referred to as the COLD END or COLD JUNCTION. The cold junction is actually formed at the last point of thermocouple material. If there is a difference in temperature between the hot junction and cold junction, a small voltage is created. This voltage is referred to as an EMF (electro-motive force) and can be measured and in turn used to indicate temperature.

The RTD is a temperature sensing device whose resistance changes with temperature. Typically built from platinum, though devices made from nickel or copper are not uncommon, RTDs can take many different shapes like wire wound, thin film. To measure the resistance across an RTD, apply a constant current, measure the resulting voltage, and determine the RTD resistance. RTDs exhibit fairly linear resistance to temperature curves over their operating regions, and any nonlinearity are highly predictable and repeatable. The PT100 RTD evaluation board uses surface mount RTD to measure temperature. An external 2, 3 or 4-wire PT100 can also be associated with measure temperature in remote areas. The RTDs are biased using a constant current source. So as to reduce self- heat due to power dissipation, the current magnitude is moderately low. The circuit shown in figure is the constant current source uses a reference voltage, one amplifier, and a PNP transistor.

F. Thermistors

Similar to the RTD, the thermistor is a temperature sensing device whose resistance changes with temperature. Thermistors, however, are made from semiconductor materials. Resistance is determined in the same manner as the RTD, but thermistors exhibit a highly nonlinear resistance vs. temperature curve. Thus, in the thermistors operating range we can see a large resistance change for a very small temperature change. This makes for a highly sensitive device, ideal for set-point applications.

G. Semiconductor sensors

They are classified into different types like Voltage output, Current output, Digital output, Resistance output silicon and Diode temperature sensors. Modern semiconductor temperature sensors offer high accuracy and high linearity over an operating range of about 55°C to +150°C. Internal amplifiers can scale the output to convenient values, such as 10mV/°C. They are also useful in cold- junction compensation circuits for wide temperature range thermocouples. A brief details about this type of temperature sensor are given below.

H. Consumer application

A growing portion of IOT devices are created for consumer use. Examples of consumer applications include connected car, entertainment, residences and smart homes, wearable technology, quantified self, connected health, and smart retail . Consumer IOT provides new opportunities for user experience and interfaces. Some consumer applications have been criticized for their lack of redundancy and their inconsistency.

4. CONCLUSIONS

At present, labour-saving and water-saving technology is a key issue in irrigation. a wireless solution for intelligent field irrigation system, based on IOT technology was proposed in this paper particularly, the toxins and hazardous metals in soil using embedded systems . instead of conventional wired connection, the wireless design made the system easy installation and maintenance. the hardware architecture and software algorithm of wireless sensor/actuator node and portable controller, acting as the end device and coordinator in IOT network respectively, the performance of the whole system was evaluated in the end. the long-time smooth and proper running of the system in the field proved its high reliability and practicability. as an explorative application of wireless sensor network in irrigation management, this paper offered a methodology to establish large scale remote intelligent irrigation system.

Thus our project creates an awareness about the automation in agricultural field. Here the manual intervention can be reduced by irrigating the plants automatically

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