

IOT BASED SMART AGRICULTURE

M.VENKATESWARLU, Assistant professor of electronics and communication engineering, GITAM (Deemed to be University), Rudraram, Patancheru Mandal, Hyderabad, Telangana, India-502329

1. BHAMIDIPATI VENKATA SAI AKHILESH,
2. KODHATI SAI VIKHYATH RAO,
3. AAYUSH CHAKRABORTY,
4. RITESH PANDITI,

Department of electronics and communication engineering, GITAM (Deemed to be University), Rudraram, Patancheru Mandal, Hyderabad, Telangana, India-502329

Abstract

In India about 70% of the total population depends upon farming and one-third of the nation's capital comes from the farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is Smart agriculture. This project will automatically sense all the different parameters like temperature, humidity and soil moisture which will be helpful in monitoring agricultural activities. The data (i.e. temperature values, humidity and soil moisture) will be uploaded to the cloud server where we can monitor the activities occurring in the agriculture site. This can be performed using Wi-fi module (ESP-8266) connected to IOT server. GSM module is also connected to the micro-controller for receiving alert messages. Because of its energy autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.

Keywords: ARDUINO UNO Microcontroller.ESP8266 Wi-Fi module, GSM, SOIL sensor, DHT11 (Temperature, HUMIDITY) sensor, LCD module, Buzzer,Waterpump.

1. Introduction

The Agriculture Parameters are utilizing an IOT Technology and system availability that draw in these objects to assemble and deal information. "The IOT enables things selected recognized or potentially forced remotely crosswise over completed the process of existing configuration, manufacture open gateways for all the additional obvious merge of the substantial earth into PC based frameworks, in addition to acknowledging overhauled capacity, precision and cash interconnected favoured stance. Precisely when IOT is extended with sensors and actuators, the improvement modify into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates

headways, for instance, clever grids, splendid homes, canny moving and smart urban groups [1]. All is especially specific through its introduced figuring configuration anyway can interoperate within the current Internet establishment.

EXISTING SYSTEM

In the existing system, there is no source of informing the farmer about the condition of his paddy field via SMS. If any of the sensors goes beyond the set limit or any problem occurs to the motor he can only know by opening the web server. To avoid this situation, we are developing the proposed system, in which the farmer can know immediately if any of the sensors goes beyond the threshold level by SMS.

PROPOSED SYSTEM:

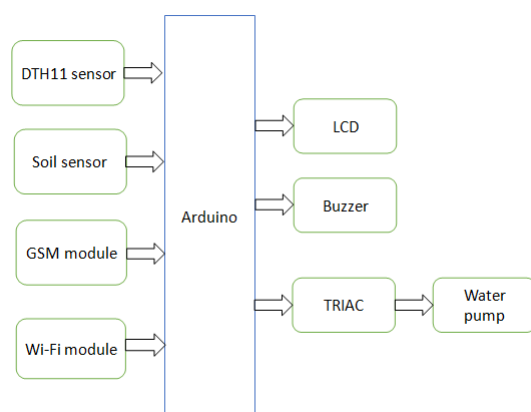
In the proposed system, we are using different sensors like temperature, humidity, soil moisture, rain fall sensors in our project. All of the sensors are interfaced to the ADC channels of the controller and displaying those digital values on the LCD screen and sending those values to the web server by using the Wi-Fi module. The farmer can login into this web server, and view the conditions of the field remotely. The motor will on automatically and supply water to the field if the moisture level is below the set threshold limit. And if any of the sensor activates, then the corresponding alert message will also send to the concerned person via SMS using the GSM module. By this way, if the net connection is not available, with the help of the alert SMS, the farmer can know the particular sensor values if it goes beyond threshold limit.

2. Literature Survey

The newer scenario of decreasing water tables, drying up of rivers and tanks, unpredictable environment present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture sensor at suitable locations for monitoring of crops is implemented in. [1] An algorithm developed with threshold values of temperature and soil moisture can be programmed into a microcontroller-based gateway to control water quantity. The system can be powered by photovoltaic panels and can have a duplex communication link based on a cellularInternet interface that allows data inspection and irrigation scheduling to be programmed through a web page. [2] The technological development in Wireless Sensor Networks made it possible to use in monitoring and control of greenhouse parameter in precision agriculture. [3]

In the studies related to wireless sensor network, researchers measured soil related parameters such as temperature and humidity. Sensors were placed below the soil which communicates with relay nodes by the use of effective communication protocol providing very low duty cycle and hence increasing the life time of soil monitoring system. The system was developed using microcontroller, universal asynchronous receiver transmitter (UART) interface and sensors while the transmission was done by hourly sampling and buffering the data, transmit it and then checking the status messages. The drawbacks of the system were its cost and deployment of sensor under the soil which causes attenuation of radio frequency (RF) signals. [4]

3. Implementation:



The controlling device of the whole project is Arduino UNO Microcontroller. Micro controller forms the controlling module and it is the heart of the device. The controller performs the

functionality of receiving data from the different sensors connected to it like DHT11 sensor, soil sensor. The received data can be monitored and displayed on LCD. The system also alerts when the agriculture parameters exceeds beyond threshold limits using GSM modem via SMS messages to the authorities and sending those values to the web server by using the Wi-Fi module. The farmer can login into this web server, and view the conditions of the field remotely. Based on soil sensor data the arduino control the water pump through triac. The smart way to monitor this device is an efficient low cost embedded system. The Microcontroller is programmed using Embedded C language.

4. Related Work:

The brief introduction of different modules used in this project is discussed below:

Adapter (DC 5v Constant Current Power Adapter for 220V AC)

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

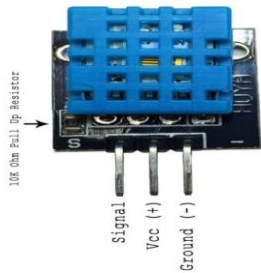


ARDUINO UNO:

The **Arduino Uno** is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



DHT11(Temperature, HUMIDITY) sensor:



DHT11 digital temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. Application of a dedicated digital modules collection technology and the temperature and humidity sensing technology, to ensure that the product has high reliability and excellent long-term stability. The sensor includes a resistive sense of wet components and NTC temperature measurement devices, and connected with a high-performance 8-bit microcontroller.

Soil moisture sensor:

Detects presence of liquid or moisture between two wire leads and gives active low output. **Soil moisture sensors** measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors



The sensor measures the dielectric constant of the soil in order to find its volumetric water content (VWC). It obtains volumetric water content by measuring the dielectric constant of the media through the utilization of frequency domain technology. Since the dielectric constant of water is much higher than that of air or soil minerals, the

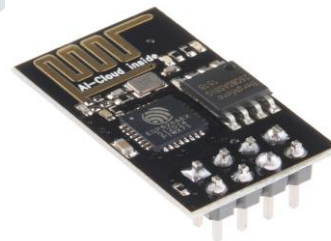
dielectric constant of the soil is a sensitive measure of volumetric water content.

GSM(SIM800A):



SIM800 is a quad-band GSM/GPRS module designed for the global market. It works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM800 features GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 24*24*3mm, SIM800 can meet almost all the space requirements in users' applications, such as M2M, smart phone, PDA and other mobile devices. SIM800 has 68 SMT pads, and provides all hardware interfaces between the module and customers' boards. SIM800 is designed with power saving technique so that the current consumption is as low as 1.2mA in sleep mode. SIM800 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

ESP 8266 Wi-Fi:



The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield

offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

LCD (LIQUID CRYSTAL DISPLAY) :



One of the most common devices attached to a micro controller is an 16x2 LCD display. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. The project status will display on LCD.

TRIAC BT136

TRIAC (triode for alternating current) is a generic trademark for a three terminal electronic component that conducts current in either direction when triggered.

TRIAC DRIVER MOC3021

These devices consist of gallium arsenide infrared emitting diodes, optically coupled to silicon bilateral switch and are designed for applications requiring isolated triac triggering, low-current isolated ac switching, high electrical isolation (to 7500 VAC peak), high detector standoff voltage, small size, and low cost. This series is designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115/240V AC operations.

WATER PUMP



A submersible water pump operates beneath the earth's surface. A submersible water pump will not operate if it is not submerged in liquid. A submersible water pump pushes water to the surface, instead of sucking the water out of the

ground like above ground water pumps. Most submersible pumps are long cylinders that are about 3 to 5 inches around and 2 to 4 feet long. Submersible water pumps have a hermetically sealed motor that is close-coupled to the body of the water pump. Having a hermetically sealed motor prevents the water from getting inside the pumps motor and causing a short circuit. Other components of a submersible water pump are the cable, which is connected to the motor, and a pipe that transports the water to the surface of the well.

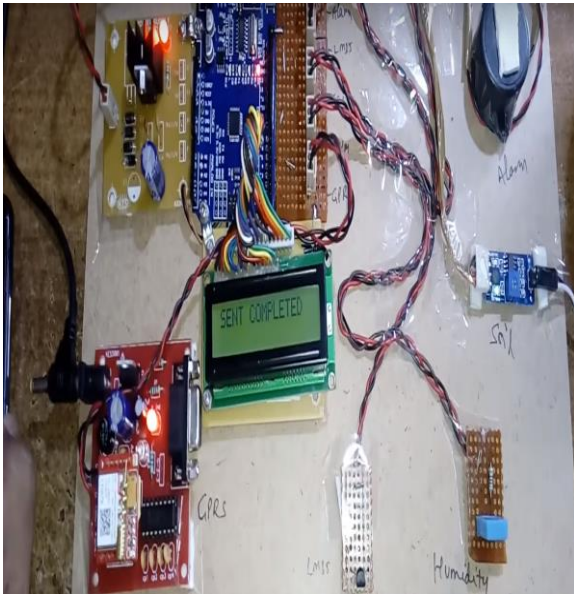
Buzzer- Indication

The buzzer produces a same noisy sound irrespective of the voltage variation applied to it. It consists of piezo crystals between two conductors. When a potential is applied across these crystals, they push on one conductor and pull on the other. This, push and pull action, results in a sound wave. Most buzzers produce sound in the range of 2 to 4 kHz. The Red lead is connected to the Input and the Black lead is connected to Ground.



Result

Assemble the circuit on the PCB as shown in circuit diagram. After assembling the circuit on the PCB, check it for proper connections before switching on the power supply. Various test was carried out before, during and after the construction has been completed. The multi-meter was extensively used for carrying out most of these tests. Each subunit was tested and confirmed efficient. After the construction of the entire system, the program was written and burned into the microcontroller chip.



6. CONCLUSION:

In this work, a design and implementation of IOT BASED SMART AGRICULTURAL SYSTEM has been proposed. This system is able to collect the information about the main environmental parameters such as: Temperature, Humidity and soil moisture.

The whole system is advanced, reliable and convenient. This design improves the real-time performance of the user to the agricultural environment change, and is conducive to the realization of the unattended goal, and promotes the development of the intelligent Agriculture system. In future, this scheme can be used as a part of the development of remote monitoring of the Internet of things and can be applied on other areas of modern facilities agriculture.

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