Sensor Network Approach For Smart Farming Using IoT

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Abstract- *Indian agriculture is diverse ranging from impoverished farm villages to developed farms utilizing agricultural technologies.Promoting application of modern information technology in agriculture will solve a series of problems facing by farmers. Lack of exact information and communication leads to the loss in production. Our paper is designed to overcome these problems.This system provides an intelligent monitoring platform framework and system structure for facility agriculture ecosystem based on IOT.This paper is proposing a system developed to optimize the use of water, energy, fertilizers for agricultural crops as a solution to this great challenge*

I. INTRODUCTION

As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture. Most projects signify the use of wireless sensor network collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors.Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems.

The project aims at making use of evolving technology i.e. IOT and smart agriculture using automation. Monitoring environmental conditions is the major factor to improve yield of the efficient crops.

The self contained nature of operation, together with modular sized hardware platforms, scalable, and cost-effective technologies, has enabled the IoT as a potential tool towards the target of self-organized, decision making, and automation in the agriculture cum farming industry.

In this regard, precision agriculture, automated irrigation scheduling, optimization of plant growth, farm land monitoring, and farming production process management in crops, are among a few key applications.

The Internet of Things (IoT) is the network of devices such as vehicles, and home appliances that contain electronics, software, actuators,and connectivity which allows these things to connect, interact and exchange data.The IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smart phones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled.

II. SYSTEM MODEL

Review Stage

In existing system ZigBee network has implemented for transferring the measured parameters.This system installed with sensors which measure the parameters of agriculture field and transfer the measured details using ZigBee network. So it only applicable for short range application.

Proposes the automatic irrigation system using Arduino for smart crop field productivity. This system consists of sensor like moisture sensor, temperature sensor, rain sensor, gas sensor and ultrasonic sensor.Moisture sensor used for detecting the moisture content in soil, temperature sensor is used to measure the temperature value and ultrasonic sensor is used to measure the water level. Rain sensor is used to check rain condition. If the excess of water in field is detected, then motor will ON to remove it.Gas sensor detects the harmful gas. If it detects it will indicate through buzzer.The measured parameters are uploaded to IOT through this farmer can monitor anywhere.Based on the command from IOT water motor will ON. The measured parameters are displays on LCD.

III. HARDWARE COMPONENTS

ARDUINO has 54 digital I/O pins, of which 14(D0 to D13) can be used as PWM outputs.16 analog input pins, which can also be used as digital I/O pins, adding to the existing 54 digital I/O pins.4 serial communication lines(pins D0, D1,

and from D14 to D19).Arduino Mega uses an ATmega2560 microcontroller which has256K Bytes of In-System Self-Programmable Flash.8K Bytes RAM.
4K Byte Internal SRAM.

The Arduino Mega2560 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.

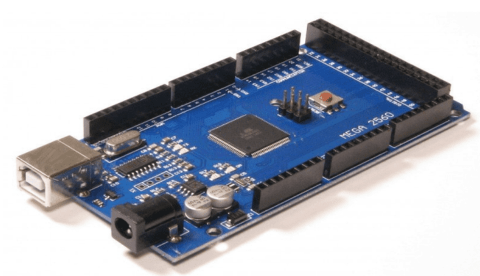
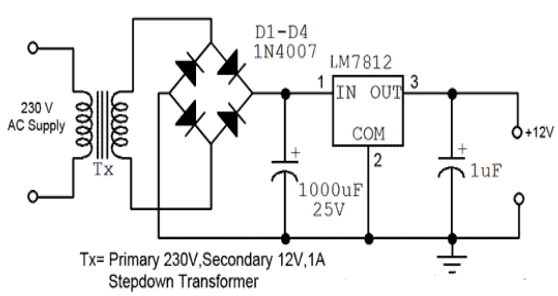


FIG.1 Arduino module

POWER SUPPLY AND OTHER SENSORS



Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU.

The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

The Moisture sensor is used to measure the water content(moisture) of soil. when the soil is having water shortage , the module output is at high level, else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture , land irrigation and botanical gardening.

Here is a way to make TIFF image files of tables. First, create your table in *Word*. Use horizontal lines but no vertical lines. Hide gridlines (Table | Hide Gridlines). Spell check the table to remove any red underlines that indicate spelling errors. Adjust magnification (View | Zoom) such that you can view the entire table *at maximum area* when you select View | Full Screen. Move the cursor so that it is out of the way. Press “Print Screen” on your keyboard; this copies the screen image to the Windows clipboard. Open Microsoft *Photo Editor* and click Edit | Paste as New Image. Crop the table image (click Select button; select the part you want, then Image | Crop). Adjust the properties of the image (File | Properties) to monochrome (1 bit) and 600 pixels per inch. Resize the image (Image | Resize) to a width of 3.45 inches. Save the file (File | Save As) in TIFF with no compression (click “More” button).

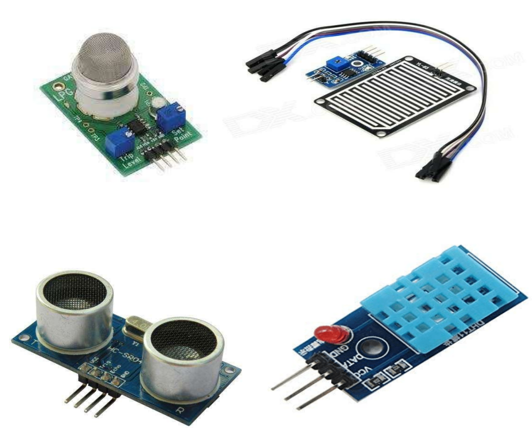


FIG 2 .Various sensors

5V DC or AC circuit
Requires heater voltage
Operation Temperature: -10 to 70 degrees C
Heater consumption: less than 750mW

FIG 3.LCD display

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly.

NodeMCU is the WiFi equivalent of ethernet module. It combines the features of WiFi access point and station + microcontroller. These features make the NodeMCU extremely powerful tool for WiFi networking. It can be used as access point and/or station, host a web server or connect to internet to fetch or upload data.

IV. SOFTWARE

Programming language - Embedded C,
Compiler - ARDUINO IDE 1.8.3
Simulation - PROTEUS

The Embedded C coding has been witten for all sensor inputs and for transmission of the all data to the cloud with the simulation for three sensors have been verified by obtaining outpur simulation for given inputs.

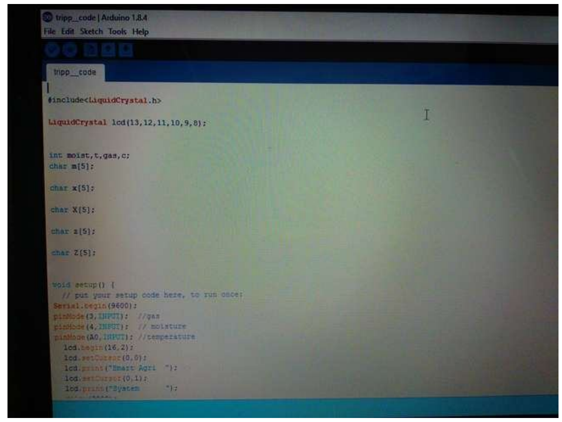


Fig : Embedde c programming in arduino software

Wireless sensor data transmission and acquisition is managed by IoT gateway router designed to connect to the WSN.

The router can work as an RF-XBee interface, local and external database for WSU. For this project the WSU sends sensor data to gateway via ZigBee protocol. The gateway automatically stores the data on its local storage with an additional capability to synchronize to an external database or connect to a cloud platform. At the time of reception inthe router, sensor data are timestamped, parsed and stored in local or synchronized to an external database. Energy data infrastructure is connected similar to the wireless sensor nodes. The protocol uses Max485 for serial communication between an Arduino Mega and the power meters. Arduino sends voltage, current and power data in frames to router

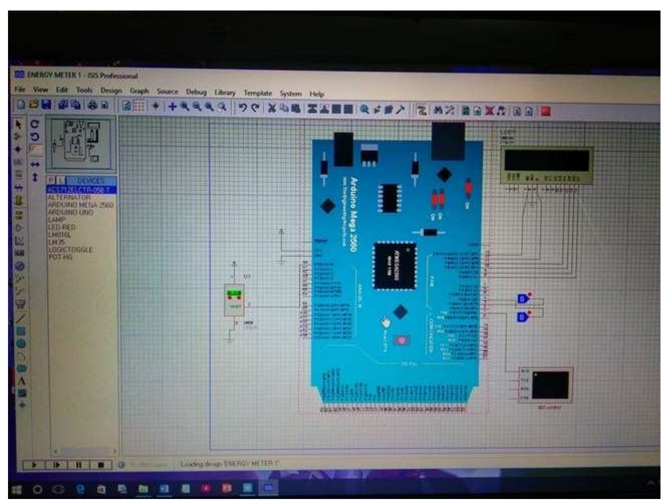


Fig: proteus simulation.

The experimental data obtained from this prototype will be modeled and optimized to investigate food production profifile as a function of energy and water consumption. It will also attempt to understand the effect of extreme weather conditions on food production. Instead of the peace-meal

approach, a holistic approach will be developed and explore the nexus between water and energy resources, and crop yield for several essential crops in an attempt to design a more sustainable method to meet forecasted surge in demand. The conventional way of thinking about these intertwined problems focus on “peace-meal approach” where decisions are made in one of the nexus areas of water, energy and food without making an allowance for the consequences on the other areas. In the future work, data collection from this smart farm will be crucial in analyzing the gap between the water, energy and crop data will be used to model the interdependency of these
systems.

V. CONCLUSION

The abundance of vast amount of data and the ability of analyzing data to make decisions have quickly become part of any sector with the advent of IoT technologies. Agriculture is one of the sectors with smart farming that relies on machine to machine communication to get precise and reliable data. This paper presents the design and implementation of smart farm prototype to further investigate and model the energy, water and food nexus in the future. In this paper, the overall system design, implementation and functionality is explained. The test-bed consists of distributed WSN that monitors different agricultural and environmental parameters. Wireless sensor data transmission and acquisition is managed by IoT gateway router through ZigBee protocol. An algorithm was established based on threshold values of temperature and soil moisture to automated into a programmable micro-controller to control irrigation time

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