IoT Enabled Smart Agriculture Monitoring and Water Pumping Control System using BLYNK Server

RAJARAM[1],KAMATCHI[2],THAMIZHKANII[3] DEPARTMENT OF ELECTRICAL AND ENGINEERING
DHANALAKSHMI SRINIVSASN COLLEGE OF ENGINEERING AND TECHNOLOGY

ABSTRACT:

The aim of proposed project is to implement real time atomization of Modern Agricultural System using IOT protocol method. These projects ensure the pumping system in agricultural sector to be a valuable process with low cost, low power, efficiency, compactness, etc. In this project, Wireless sensor network (IOT) have been developed for environmental agricultural monitoring and management of the crop field. Wireless nodes developed were capable of transmitting environmental measurements at scheduled intervals. The data from a network of these sensors could be used to vastly improve agriculture management and environmental protection practices through a more accurate modelling of crop-growth, hydrologic flow and carbon-nutrient cycling processes. This system was designed to monitor the status of temperature, humidity and soil moisture using android mobile phone. The IOT does not require any external power supply as it obtains its energy from a solar panel which is a renewable source of energy. Various nodes in different places are connected via IOT which transmits and receive the data in a node that transmits the status of the crop field to the user through IoT (blynk server) to control the pumping system.

KEYWORD: IoT, BLYNK, WIRELESS SENSOR.

1.INTRODUCTION

Agriculture has been the most important practice from very beginning of the human civilization. It has seen many iterations of development in technology with time. A good agricultural practice is still an art. In last few decades changing weather condition, increase in global temperature and pollution, has led to abnormal environmental conditions like raining. Traditional way of farming is unable to cope with these environmental changes. Good control over Environmental parameters like temperature, humidity, and moisture plays important role in growth of the plant. Temperature affects many of plant activities such as pollination, germination etc. It is observed that, at higher temperature,
respiration rate increases that result in reduction of sugar contents of fruits and vegetables. At lower temperatures photosynthesis activity is slowed down. Till date many methods have come into existence where water can be limitedly consumed. A method where monitoring water status and based on status of water whether it is high or low irrigation is scheduled which is based on canopy temperature of plant, which was captured with thermal imaging. Another method is making use of information on volumetric water content of soil, using dielectric moisture sensors to control actuators and save water, instead of the scheduled irrigation at a particular time of day

and supplying water only for a specific duration.

This above method just opens the valve and supply water to bedding plants when volumetric content of soil will drop below threshold value. In this paper a use of the second method where sensors are placed and based on that water is supplied to the field and intimated to the farmer using software application. Wireless sensor networks is also called as wireless sensors and actor network, are distributed spatially autonomous sensors to monitor physical or environmental conditions as temperature, pressure sound, moisture etc. and it co-operatively passes these data via network to the main location.

EXISTING SYSTEM

The challenges in agricultural applications may be developed from the selection of the deployment range. For instance, the transmitted signal by the sensor node is attenuated when the agriculture field is separated by obstacles. The „Zigbee" wireless protocol was designed to run with a suitable communication range and low power consumption. Lora and Sigfox are considered to work with low power consumption and long radio range. Zigbee and Bluetooth low energy are designed for battery powered devices.

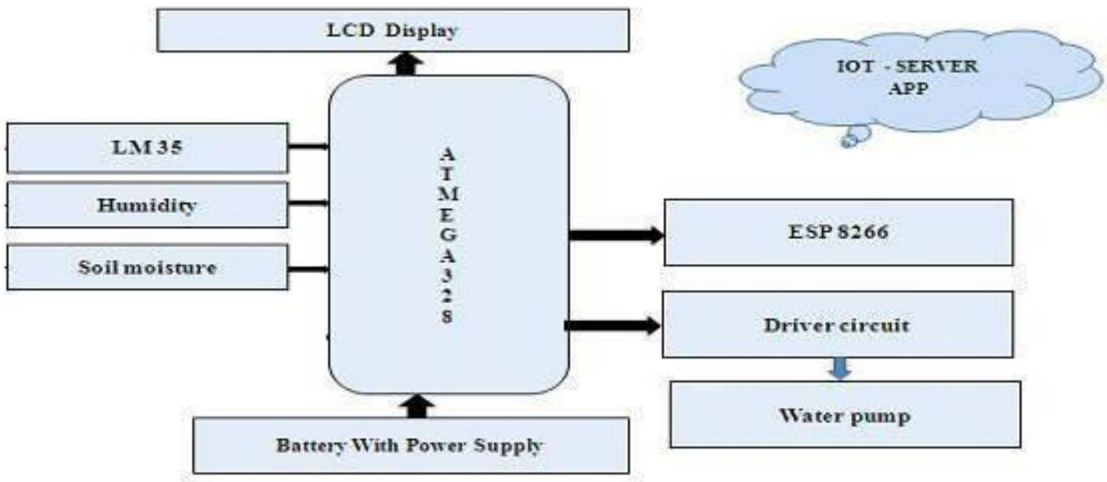
These Technologies conserve power through low duty cycling and enter sleep mode to extend the Battery lifetime. Classic BT, Wifi, GPRS, Lora and Sigfox have higher power consumption than Zigbee. Although Zigbee has a shorter communication range than Lora, Sigfox and GPRS, this range may be extended with a router node to overcome the node deployment limitations in agricultural applications.

PROPOSED SYSTEM:

In the Internet of Things (IoT) pattern, all things which are everywhere will be on the network in one form or another. The purpose of this study paper is based on the Internet of Things (IoT) technology which is being applied to the agriculture sector. To successfully construct such a smart agricultural environment, the development of essential Internet of Things (IoTs) technology optimized for agriculture. Such as sensor hardware, middleware platforms, routing protocols and application services for agricultural environment is needed. Building IoTs has advanced significantly in the last couple of years since it has added a new dimension to the world of information and communication technologies. According to the blog of “progression from M2M to the “Internet of Things”, it is expected that the number of devices connected to the internet will accumulated from 100.4 million in 2011 to 2.1 billion by the year 2021,growing at a rate of 36% per year. The sensor nodes are arranged randomly or orderly in the working environment through the wireless communication.

2. PROJECT DESCRIPTION

BLOCK DIAGRAM



WORKING PRINCIPLE:

In this section, we proposed various aspects regarding the design along with implementation of Controlled Environment Agriculture (CEA). CEA"s system provides automated control and monitoring programme. This proposed work is intended to offer ease of use. Effective and reliable control system. It helps in reducing the amount of water and energy required. This system will increase yield for farmers at a moderate and accessible cost. The proposed system is modelled using Arduino mega development kit which connects to light sensor for measuring the light intensity, environment temperature/humidity sensor for getting the temperature and humidity in surroundings. Moreover, this system can be used to continuously analyse the temperature, water level and the amount of light reaching the plants which is vital for greenhouse system.Temperature and humidity measurement are required for the analyzing the environmental surrounding of the plants. Various plant species have distinct ideal temperature and humidity ranges. Examining and controlling the temperature and humidity of the plants from droughts and extreme temperatures.

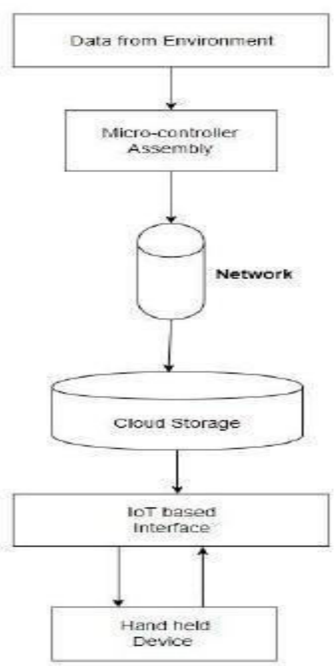
Furthermore, the light sensor is essential in measuring the information regarding the levels of light received by the crops. This system encompasses a wide range of sensors. The Arduino mega development kit contains a microcontroller in built, and helps us to integrate all the sensors and display the sensor readings can also acts as input device. A User Interface is used to take the input from the touch LCD. Moreover, the system has IoT module, which sends the sensor readings to the server over the Wireless Network. The server further allows the user to access the sensor data at any time.

3. MODULE DESCRIPTION.

MODULE 1

IOT ENVIRONMENT

One way to address the Agriculture issues and increase the quality and quantity of agricultural production is using sensing technology to make farms more "intelligent" and more connected through the so called "precision agriculture" also known as 'Smart Agriculture. We are creating the module which senses Humidity, Temperature, and Moisture of soil, rain frequency and light Intensity. Through an interface, it suggests to the farmer which is the suitable seed for the farm. The architecture of the system consists of sensors like humidity, moisture and temperature sensor, a Wi-Fi module. The software consists of an IoT platform which includes set up of the profile for irrigation based on the seasons or on daily and weekly mode. The software sends notification Main Module to switch On/Off the system.



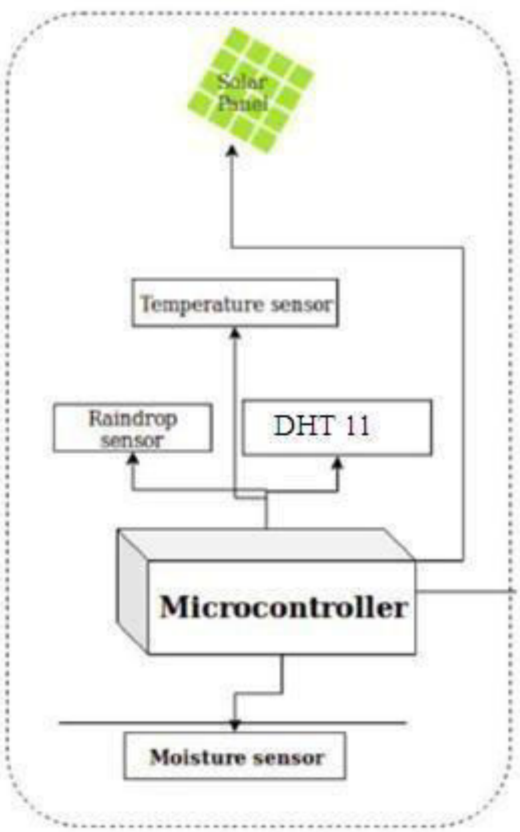
Sensors sense all the physical parameters and convert the analogue value to digital value. Humidity and Temperature sensors are used to estimate the humidity and temperature respectively on field. Soil Moisture Sensor immersed in the soil is of capacitive type, and is used to estimate the moisture content of the soil. For obtaining data in real time from the sensors, a module is combined. This data is then transmitted to the IOT gateway. The IOT gateway then transmits the data to the IoT platform (Cloud) using the Wi-Fi module. The cloud in the system will include a database. The database will maintain the data received from the IOT gateway. Fig. 1 is the Diagram of Proposed system which consists of six modules

i.e. Acquiring Data from the environment, Microcontroller Assembly, Network, Cloud storage; IoT based Interface and Handheld Device.

MODULE 2

Data from Environment

The moisture from the soil is determined by the FC-28 soil moisture sensor and moisture content of the soil measured in percentage. The humidity andtemperature are determined by DHT11 a Humidity and Temperature Sensor in percentage and Celsius respectively. The light intensity is measured by LM393 light sensor in candela. The rain frequency is determined by FC-37 a rain sensor in millimeters.



Microcontroller assembly

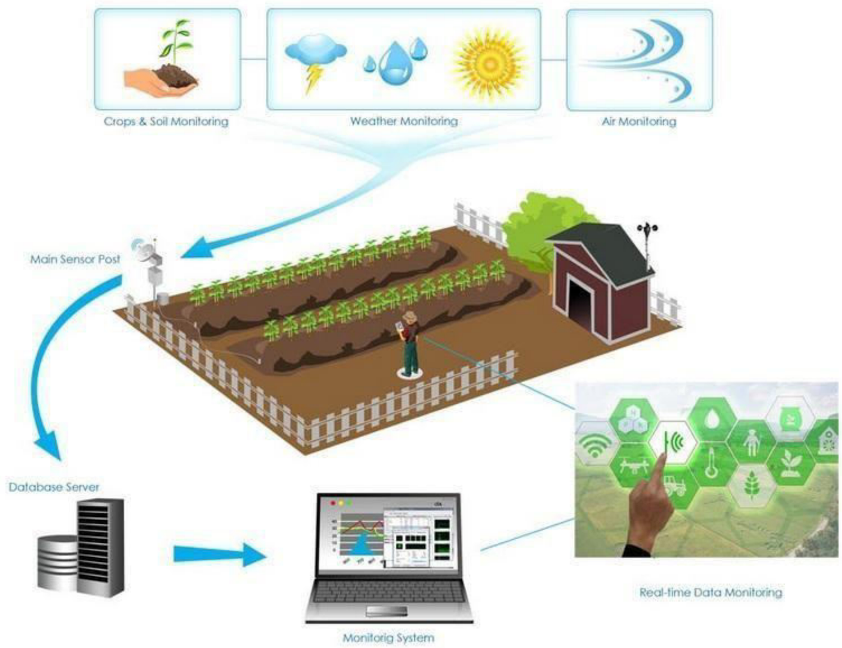
Fig Shown is the constituents of Microcontroller assembly in the proposed system. This Microcontroller assembly is the hardware part of the system and governs the data acquisition via the sensors present in it. The microcontroller job is to communicate with cloud storage and has a Embedded Wi-Fi module which has the Wi-Fi range up to 300 meters which helps to propagate information through the network

MODULE – 3

SYSTEM ARCHITCTURE

Network and Cloud storage

The Network is responsible to propagate the data to cloud storage, which analyses and performs calculations with sensor data obtained which is in the form of raw data and displays it on the IoT interface. The network between the Hardware components to the cloud can be established in two ways, either it can be through MQTT agents using the MQTT protocol, or through HTTP module utilizing the HTTP protocol. MQTT is preferred over HTTP, as it is message driven and HTTP is document driven, so MQTT could be more reliable.



IoT based interface

IoT integration is concerned with APIs, the applications communicates with each IoT devices using logical connectors. APIs exhibit data that enables those devices to transmit data to the application, acting as a data interface. They also allow your application to take control of the device and act as a function interface.

Hand held Device

The monitoring of the data can be done in web based or mobile application. The data received from the sensor are displayed in these applications which act as user interface. These applications are operated in portable device like mobile phones which has LCD to display the data.

4. SOFTWARE DESCRIPTION

Arduino is a cross-platform IDE that works in conjunction with an Arduino controller in order to write, compile and upload code to the board.The software provides support for a wide array of Arduino boards, including Arduino Uno, Nano, Mega, Esplora, Ethernet, Fio, Pro or Pro Mini, as well as LilyPad Arduino.

The universal languages for Arduino are C and C++, thus the software is fit for professionals who are familiar with these two. Features such as syntax highlighting, automatic indentation and brace matching makes it a modern alternative to other IDEs.Wrapped inside a streamlined interface, the software features both the looks and the functionality that appeal to Arduino developers, paving the way to a successful output via the debugging modules.

Arduino is an open-source computer hardware and software company, project and user community that designs and manufacturesmicrocontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards ("shields") and other circuits.

BLYNK IOT PLATFORM

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for our project by simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering in less than 5 mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet of Your Things. Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things independent variables, they are considering and the number of independent variables being used.

Linear regression performs the task to predict a dependent variable value (y) based on a given independent variable (x). So, this regression technique finds out a linear relationship between x (input) and y(output). Hence, the name is Linear Regression.

5. CONCLUSION

This project presents a farm monitoring and automatic irrigation system that has three modules: (i) unified sensor pole (USP), low cost and intelligent IoT based module, (ii) irrigation unit (IU), and (iii) sensor information unit (SIU). For user access, USP initially remains for some time in admin mode where it gets crop, plantation date and soil data, which it uses in one-time setup mode for evapotranspiration and irrigation schedule computation. Finally, it goes into a continuous monitoring mode where it senses the data, uses it for NN based decision making, sends the decision to IU and sensor data to SIU. The IU is responsible for parsing and writing incoming data from USP to correct port and turning ON/OFF water for the required zone. It keeps on checking for incoming clients and performs accordingly. SIU stores the sensor data by directing the incoming data stream on Mosquitto broker to log files, which is used by the HTTP server running on the same machine to allow remote sensor data monitoring. Detailed results for all the modules have been presented in the paper for a sample testbed. The cost of USP (brain of the system) is around $800–$1000 ("$"12– "$"15). Overall water savings of ≈67% over traditional way is achieved using the system. Thus effective water utilization and visit-free monitoring provides smart solution in water scare areas and people far away from their farms. The necessity of preserving this natural resource justifies the usage of such automatic systems. Its easy access, cost effectively and usability make it versatile and thus suitable for varied population and, potential like, adaptively and portability make it fit for use in house vegetation, greenhouse, etc.