International Journal of Scientific Research in Science, Engineering and Technology (www.ijsrset.com)
© 2020 IJSRSET | Volume 7 | Issue 3 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
DOI : https://doi.org/10.32628/IJSRSET

IOT Based Smart Irrigation Monitoring

Mayuri U Bhosale[1], Pooja P Pawar[2], Tushar R Shinde[3], Prof. More Prashant[4], Prof. Sudhir N Divekar[5], Dr. Vijay N Patil[6]
[1-6]Department of Electronics and Telecommunication Engineering, HSBPVT'S GOI Parikrama College of Engineering Kashti, Maharashtra, India

ABSTRACT

In olden Days Farmers used to figure the ripeness of soil and influenced suspicions to develop which to kind of yield. They didn't think about the humidity, level of water and especially climate condition which terrible a farmer increasingly The Internet of things (IOT) is remodeling the agribusiness empowering the agriculturists through the extensive range of strategies, for example, accuracy as well as practical farming to deal with challenges in the field. IOT modernization helps in assembly information on circumstances like climate, dampness, temperature and fruitfulness of soil, Crop web based examination empowers discovery of wild plant, level of water, bug location, creature interruption in to the field, trim development, horticulture. IOT utilize farmers to get related with his residence from wherever and at whatever point. The Agriculture stick being proposed in integrated with Arduino Technology, Breadboard mixed with various sensors and live data feed can be obtained online from Thingsspeak.com. The product being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds

Keywords : Internet of Things (IoT), Agriculture, Agriculture IoT, Agriculture Precision, Arduino Mega 2560.

I. INTRODUCTION

The next era of Smart Computing will be totally based on Internet of Things (IoT). Internet of Things (IoT), these days is playing a crucial role of transforming "Traditional Technology" from homes to offices to "Next Generation Everywhere Computing". "Internet of Things" (Weber,R.H, 2010) is gaining an important place in research across the nook and corner of this world especially in area of modern wireless communications. 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. Hence, automation must be implemented in agriculture to overcome these problems. In order to provide solution to such problems, it is necessary to develop an integrated system which wills improve productivity in every stage [1]. But, complete automation in agriculture is not achieved due to various issues. It includes smart irrigation with smart control based on real time field data. Smart warehouse management which includes; temperature maintenance, humidity maintenance, soil moisture maintenance. Controlling all of these operations will be though any remote smart device or computer connected to internet and the operations will be performed by interfacing sensors and Wi-Fi.

II. SYSTEM BLOCK DIAGRAM AND DESCRPTION

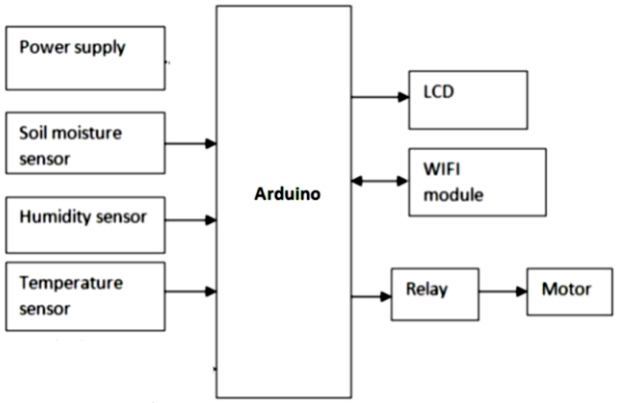


Fig 1. Block Diagram of System

3.1) BLOCK DIAGRAM DISCRIPTION:

The Arduino based smart farming consists of six section namely power supply, sensing unit, Arduino, display, wi - fi module. Relay driver and a few discrete components. The sensors sense parameter and give output to the Arduino Arduino will compare with standard value and output given to the display. The IC 7812 is used to provide 12V supply to the circuit [2].

Arduino decodes the receive signal and control the relays through its port pins. WI - fi module is used for wireless communication to get the message to farmer through thing speak. LCD is provided for observing the parameters output signals.

3.2) HARDWARE REQUIRED

1. Arduino Board
2. Power Supply
3. Sensing Unit
4. Relay Driver
5. Wi-Fi Module
6. Display
7. Connecting Wires
8. Motor

HARDWARE DISCRIPTION

4.1) Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), 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. The Mega is compatible with most shields designed for the Arduino[3].

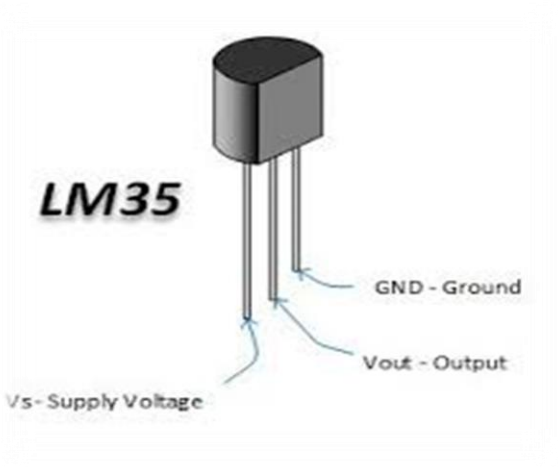
Arduino Mega 2560 is based on ATmega2560. Consists of 54 digital Input/ Output pins, 16 analog inputs, 4 UART (Universal Asynchronous Receiver and Transmitter). Can simply connect to PC via USB port.

Specifications:-

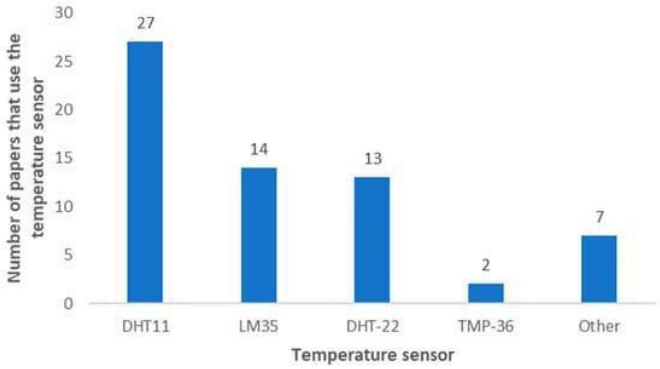
Microcontroller -. ATmega2560
Operating Voltage. - 5V
Input Voltage (recommended). - 7-12V
Input Voltage (limits) - 6-20V
Digital I/O Pins. - 54 (of which 14 provide PWM output)
Analog Input Pins 16
DC Current per I/O Pin. - 40 mA
DC Current for 3.3V Pin -50 mA
Flash Memory -256 KB of which 8 KB used by boot loader
SRAM. - 8 KB

SENSING UNIT

A) Temperature Sensor LM35



The LM35 is precision IC temperature sensor. Output voltage of LM35 is directly proportional to the centigrade/Celsius of temperature. The LM35 does not need external calibration or trimming to provide accurate temperature range. It is very low cost sensor. It has low output impedance and linear output. The operating temperature range for LM35 is -55˚C to +150˚C. With rise in temperature, the output voltage of the sensor increases linearly and the value of voltage is given to the microcontroller which is multiplied by the conversion factor in order to give the value of actual temperature.



LM35 Regulator Features:

- Minimum and Maximum Input Voltage is 35V and -2V respectively. Typically 5V.
- can measure temperature ranging from -55°C to 150°C
- ● Output voltage is directly proportional (Linear) to temperature (i.e.) there will be a rise of 10mV (0.01V) for every 1°C rise in temperature.
- ±0.5°C Accuracy
- Drain current is less than 60uA
- Low cost temperature sensor
- Small and hence suitable for remote applications
- Available in TO-92, TO-220, TO-CAN and SOIC package

LM35 Temperature Sensor Applications:

- Measuring temperature of a particular environment

B) Soil Moisture Sensor

Soil moisture sensor measures the water content in soil. It uses the property of the electrical resistance of the soil. The relationship among the measured property and soil moisture is calibrated and it varies depending on environmental factors such as temperature, soil type, or electric conductivity. Here, It is used to sense the moisture in field and transfer it to raspberry pi in order to take controlling action of switching water pump ON/OFF.

Features

- Accurately measures soil moisture using patented modified TDT technology
- Self-calibrates to all soil types and conditons
- Soil moisture readings are within ±3% of the actual volumetric soil moisture content

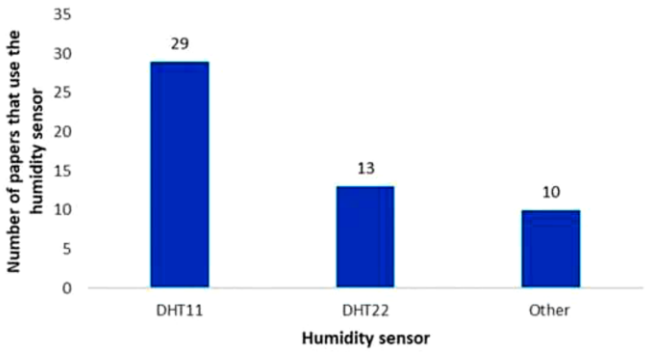
- Measurement ranges from 5% moisture to fully saturated soil

Specifications

- Sensor blade is constructed of a multi-layer fiberglass stck
- No electrical contact with soil
- Has a built-in temperature sensor used while calibrating the soil moisture readings
- Can only be connected to Baseline controllers
- Requires 3M™ DBR/Y-6 or equivalent wire connections on the two-wire side
- Requires all connections to be installed according to manufacturer's instructions
- Comes with 50 feet of 18-gauge (UL) direct burial, dual conductor irrigation cable to connect to the two-wire (voltage rating: 300V, temp rating: 167°F (75°C))
- Has a standard warranty of 5 years from the date of installation [4].

C) Humidity Sensor

The DHT11 is a basic, low-cost digital temperature and humidity sensor. It gives out digital value and hence we can give its output directly to data pin instead of ADC. It has a capacitive sensor for measuring humidity. The only real shortcoming of this sensor is that one can only get new data from it only after every 2 seconds.



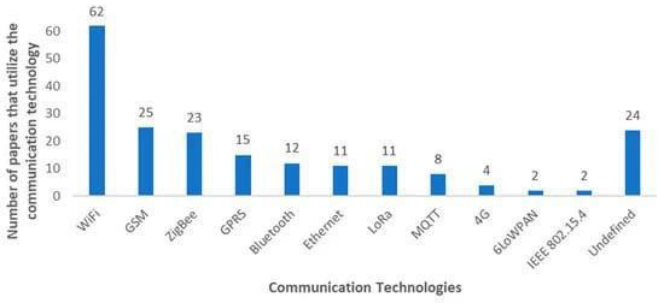
FEATURES

- Full interchangeability with no calibration required in standard conditions
- Instantaneous desaturation after long periods in saturation phase
- Compatible with automatized assembly processes, including wave soldering, reflow and water immersion (1)
- High reliability and long term stability
- Patented solid polymer structure
- Suitable for linear voltage or frequency output circuitry
- Fast response time
- Individual marking for compliance to stringent traceability requirements

Wi-Fi MODUL (ESP8226)

ESP8266 Wi-Fi Module is SOC with TCP/IP protocol stack integrated which facilitates any microcontroller to access Wi-Fi network. ESP8266 module is cost effective module and supports APSD for VOIP Applications and Bluetooth co-existence interfaces.

.



QUICK OVERVIEW

- 802.11 b/g/n Standards
- Wi-Fi Direct (P2P), soft-AP
- MB Flash Memory

- Integrated low power 32-bit CPU could be used s an application processor
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms

- Standby power consumption of < 1.0mW (DTIM3)Technical Specifications: 802.11b/g/n; Wi-Fi Direct, 1MB Flash Memory, SDIO 1.1/2.0, SPI, UART, Standby Power Consumption of <1.0mW.
- The ESP 01 ESP8266 Serial WIFI Wireless Transceiver Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor

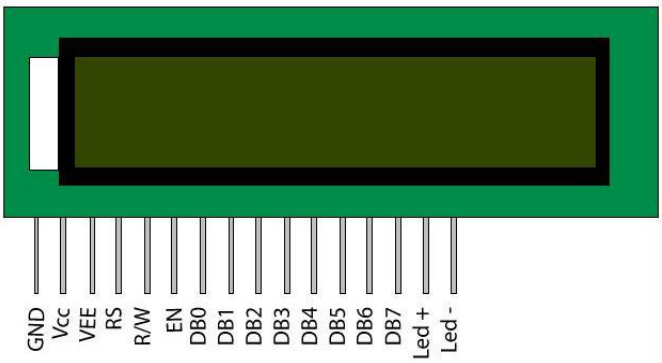
Features

- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack.
- It features an integrated TR switch, balun, LNA, power amplifier and matching network
- Equips integrated PLL, regulators, DCXO and power management units
- Integrated low power 32-bit CPU could be used as an application processor
- SDIO 1.1 / 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

Specifications

Standard: - 802.11 b/g/n
Output Power (dBm):- 19.5
Length (mm):- 25
Width (mm):- 15
Height (mm):- 1.33
Shipment Weight: - 0.125 kg
Shipment Dimensions: - 3.5 × 2.5 × 2 cm

LCD DISPLAY



Here we used LCD 16x2 display for displaying status of motor whether it is ON or OFF. It also shows monitoring parameter. An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

SOFTWARE REQUIREMENT

a) Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac OS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

b) ThingSpeak:

According to its developers, "**ThingSpeak** is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates".

ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications. ThingSpeak has integrated support from the numerical computing software MATLAB from Math Works, allowing ThingSpeak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Math works.

ThingSpeak has a close relationship with Math works, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Math works' Matlab documentation site and even enabling registered Math works user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Math works, Inc.

III. ADVANTAGES

The following are the benefits of IoT in Agriculture:

1. IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.
2. IoT is regarded as key component for Smart Farming as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.
3. With IoT productions costs can be reduced to a remarkable level which will in turn increase profitability and sustainability.
4. With IoT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.
5. With IoT, various factors would also lead to the protection of environment.

IV. FUTURE SCOPE

Our project can be improvised by using a sensor to note the soil ph value such that usage of unnecessary Fertilizers can be reduced. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. Further, it also reduces the investment of farmers. This project is basically to regulate and overcome all the obstacle for

control over the irrigation parameter. With the help of project different irrigation parameter can be monitor with another sensors.

V. CONCLUSION

Water management is paramount in countries with water scarcity. This also affects agriculture, as a large amount of water is dedicated to this use. The rising concerns about global warming have led to the consideration of creating water management measures to ensure the availability of water for food production and consumption. Thus, the researches on water usage reduction for irrigation have increased over the years. In this paper, we have provided an overview of the actual state of the art regarding IoT irrigation systems for agriculture. We have identified the most monitored parameters to characterize water quality for irrigation, soil and weather conditions. We have also identified the most utilized nodes to implement IoT and WSN systems for the irrigation of crops and the most popular wireless technologies. Furthermore, the current trends in the implementation of IoT systems for crop management and irrigation have been discussed as well.

As future work, we are developing a smart irrigation system that evaluates water quality prior to irrigation based on the proposed architecture.

VI. REFERENCES

[1] Muthunoori Naresh, P Munaswamy " Smart Agriculture System using IoT Technology" International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7 Issue-5, January 2019.

[2] Anand Nayyar and Er. Vikram Puri "Smart Farming: IoT Based Smart Sensors Agriculture Stick for Live Temprature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology" Conference Paper · November 2016

[3] Sudhir N. Divekar, Sagar R. Patil, Satish A. Shelke, "Smart Bus System", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 4 Issue 4, pp. 585-588, March-April 2018

[4] Mrs.T.Vineela1, J. NagaHarini2, Ch.Kiranmai3, G.Harshitha4, B.AdiLakshmi5"IoT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi" International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 01 | Jan-2018

[5] k.lakshmisudha, swathi hegde, neha cole, shruti iyer, " good particularity most stationed cultivation spinning sensors", state-of-the-art weekly going from microcomputer applications (0975-8887), number 146-no.11, july 2011

[6] nikesh gondchawar, dr. r.complexion.kawitkar, "iot based agriculture", all-embracing almanac consisting of contemporary analysis smart minicomputer additionally conversation planning (ijarcce), vol.5, affair 6, june 2016. Overall Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 5 Issue: 2 177 – 181

[7] M.K.Gayatri, J.Jayasakthi, Dr.G.S.Anandhamala, "Giving Smart Agriculture Solutions to Farmers for Better Yielding Using IoT", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural

[8] Lustiness. r. nandurkar, slant. r. thool, r. tumor. thool, "plan together with situation coming from rigor horticulture technique executing trans-missions sensor network", ieee world consultation toward telemechanics, regulate, intensity also wiring (aces), 2014. Development (TIAR 2015).

Cite this article as :

Mayuri U Bhosale, Pooja P Pawar, Tushar R Shinde, Prof. More Prashant, Prof. Sudhir N Divekar, Dr. Vijay N Patil, "IOT Based Smart Irrigation Monitoring", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 7 Issue 3, pp. 488-494, May-June 2020.

Journal URL : http://ijsrset.com/IJSRSET2073106