# SMART AGRICULTURE – AUTOMATIC IRRIGATION USING IOT AND GSM

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**Abstract -** Agriculture plays an important role in the development of the agricultural world. The development of equipment based on Intelligent Smart Farming IoT is daily transforming the face of an agricultural product by not only improving it but also making it more economical and reducing waste. This project promotes the concept and features of the online sensory world of agricultural materials used to improve crop production. We propose a product-based agricultural system that uses IoT technology and a Global System for Mobile Communication (GSM) module that provides accurate measurements to mobile users. It will save the hiring budget and avoid wasting water on daily needs.

***Key Words***: Smart Agriculture, Internet of Things, IoT, Arduino UNO, ATmega320, GSM, Soil moisture sensor, DHT11, Rain sensor, Irrigation, Relays.

## 1. INTRODUCTION

Agriculture is considered to be the basis of human life as it is the main source of food for other crops. It initiates an important role in the economic development of the country and also provides sufficient business opportunities for individuals. Development in the agricultural sector is crucial to improving the nation's financial situation. Unfortunately, a variety of farmers are still using traditional development methods that get lower yields and standard yields. In any case, anywhere robot production is done and people have been replaced by fixed machines the harvest has improved. The use of smart strategies such as accurate farming, proper water management, soil moisture monitoring and moisture monitoring are sure ways to increase yields per hectare of land. Precision Agriculture avoids the excessive use of pesticides and fertilizers and enables the farmer to use the land according to its quality and environment. Precision Farming is a potential savior at a time when India's water tables are dwindling at an alarming rate due to a need never before seen by the agricultural and industrial sectors. From now on there is a need to see modern science and advances in the field of agriculture in order to increase yields.

Most of the papers suggest the use of a remote sensor mastermind that collects data from different types of sensors and later sends it to a master server using a remote display. The data collected provides information about the various parts of the environment that explore the structure. Evaluating common components is not enough and it is not enough and a complete reaction to improve yield yields. There are a number of different components that contribute to production at an immeasurable level. These variables include bed bug infestations and insect bites that can be prevented by spraying the crop with official pesticides and insecticides. Additionally, wild animals and birds lurk as the crop grows. In the same way there is a chance that there will be a harvest when it is time for a public consultation.

## 2. PROBLEM DEFINITION

The trend for smart agriculture system is ongoing and many researchers have brought out many ideas in smart agriculture system. The main issue is the internet facility. Many research papers are based on cloud service monitoring. Many papers have not given product based approach. Addition to these sensors with variable sensing technologies and cost effective is also a required facility. The trend for accuracy should always improve. Programming should be much more refined.

## 3. PROPOSED SYSTEM

In this paper we have proposed a system in which the user gets intimated about the operation of motor and the ground values. GSM is used in our proposed solution, as it covers a wide range of communication. As GSM is used, the user can get the measured values on command using call or SMS. We have proposed a low budget product based project. The sensors are rightly placed and programmed & calibrated accurately. We can request for the data anywhere and at anytime.

## 4. REQUIREMENT SPECIFICATIONS

**Table -1:** Hardware Used

| COMPONENTS | USES / TYPES |
|---|---|
| Arduino UNO | A micro-controller board with Atmega320 controller |
| Sensors | Soil Moisture, Raindrop, DHT11(Humidity), Line |
| Relays | Used to connect various types of devices |
| GSM Module | SIM900 / SIM900A. Used to send measurements to user |

**Table -2:** Software Used

| SOFTWARE | USES |
|---|---|
| Arduino | Used to program the arduino board |

## 5. LITERATURE SURVEY

Fidaus Kamaruddin, Nik Noordini Nik Abd Malik, Noor Asniza Murad, Nurul Mu'azzah Abdul Latiff, Sharifah Kamilah Syed Yusof, Shipun Anuar Hamzah, "*IoT based intelligent irrigation management and monitoring system using arduino*", - In this paper, the system manages to save the usage of water and prevent the plants from being overwater or flood. The system also successfully implemented several methods, i.e. sensor nodes packaging that can differentiate each of user's plants; wireless communication between sensor nodes, base station and android application for controlling system in an unlimited range; and Wi-Fi routine checker to overcome the disconnection of an internet. [3]

Mr. CH. M.H. Saibaba, A. Kumar Sai Pavan, S. Manideep, K. Venkatesh, "*Smart Agriculture system using thinkspeak and mobile notification*" - In this paper, they presented a clear idea about the usage of Thinkspeak and its connectivity with IoT. ThingSpeak additionally gives different applications to incorporation with web administrations, different APIs and interpersonal organizations and gives the ability to make the applications as module. [4]

A.P. Atmaja, A.E. Hakim, A.P.A. Wibowo, L.A. Pratama, "*Communication Systems of Smart Agriculture Based on Wireless Sensor Networks in IoT*"- From the research that has been done, we took that the communication system at Smart Agriculture based on Wireless Sensor Networks in Internet of Things has been built and can communicate with the Raspberry Pi to receive ultrasonic sensor data, soil pH sensors, soil moisture sensors and transmit to servers so that they can accessed online using the internet. [5]

Aditya Pai, Siddham Shah, Ritik Bohara, *"Smart Agriculture"*, - In this paper, IoT-Based temperature and humidity detecting system provide an efficient and definitive system for monitoring agricultural parameters. The corrective action can be taken. IoT-Based monitoring of field not only allows user to reduce the human work and time, but it also permits user to analyze accurate changes in the atmosphere and for taking possible action. [6]

## 6. METHODOLOGY

As explained in the proposed system, we have used sensors like soil moisture sensor, raindrop sensor, humidity sensor (DHT11), line sensor, and water sensors. All these sensors are connected with Arduino. GSM module is used for transmitting the data to the users by SMS (Short Messaging Services). As GSM is used the user can also request the data using call. The operation of motor for the water can also be controlled by the user through call and SMS.

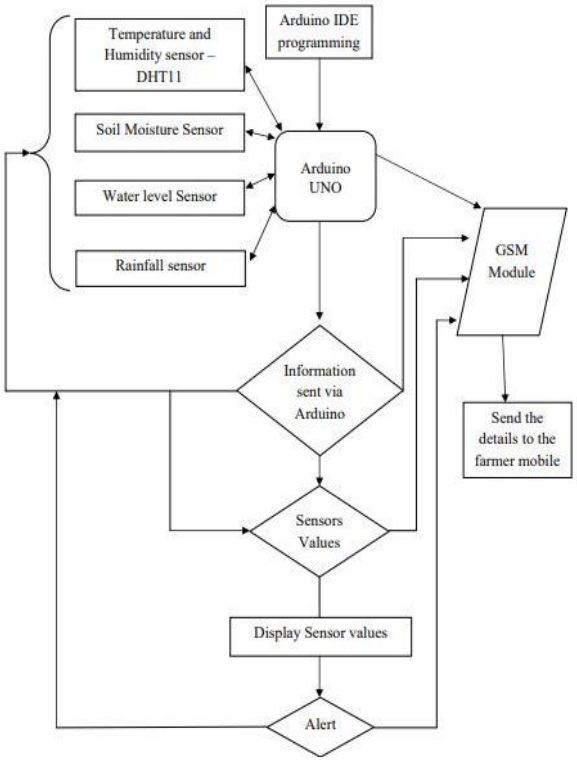



**Fig -1**: Data Flow Diagram

## 7. SYSTEM OVERVIEW

Starting from the sensors connected in the farm or in the agricultural land, these sensors are connected to Arduino through wires and breadboard. These wires can also be soldered. The data is sent to the farmer's mobile phone as SMS through GSM module every two hours.

On the other hand, the farmer can request for particular data via SMS or call and can also operate the motor and get the information about the operation of motor. This request is done either via SMS or call and is reached to Arduino with help of GSM module and sends the required data via SMS.

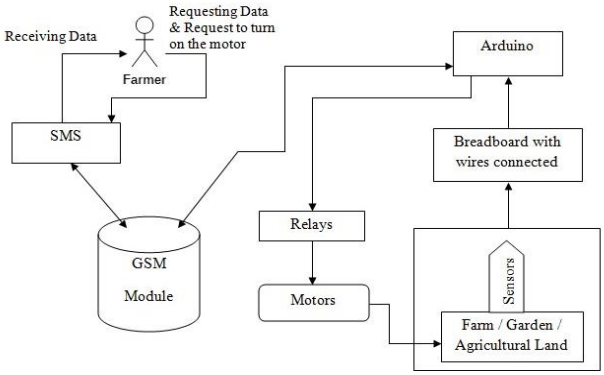



**Fig -2**: System Architecture Diagram

For the operation of motor, the Arduino checks and responds the motor operation with the use of relay and replies the farmer whether the motor is turned ON or turned OFF and it even turns the motor ON or OFF on command.

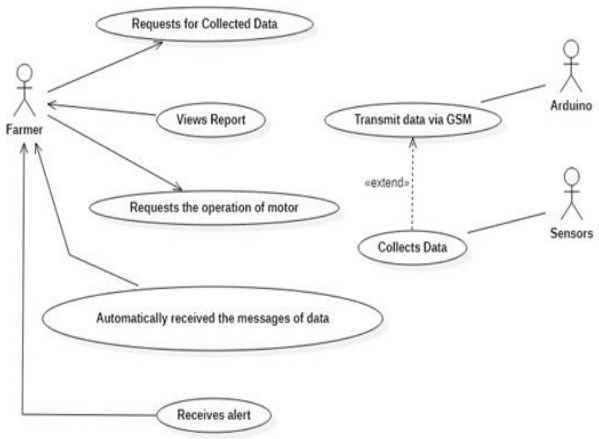



**Fig -3**: Use Case Diagram

## 8. MODULES OF THE PROJECT

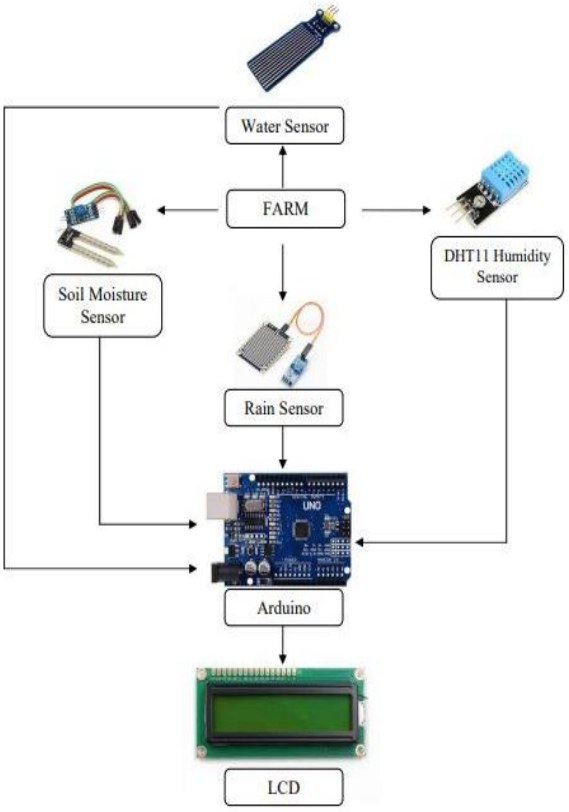



**Fig -4**: Module 1 – Sensing Module

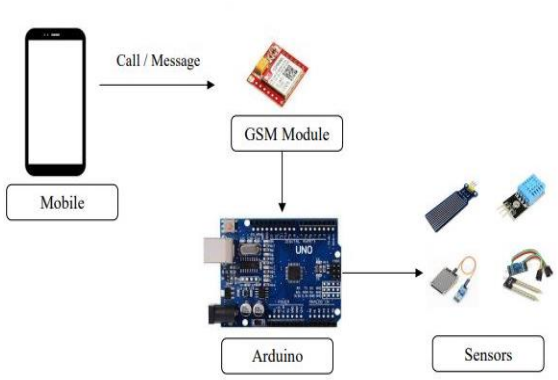



**Fig -5**: Module 2A – GSM Module – Requesting Data

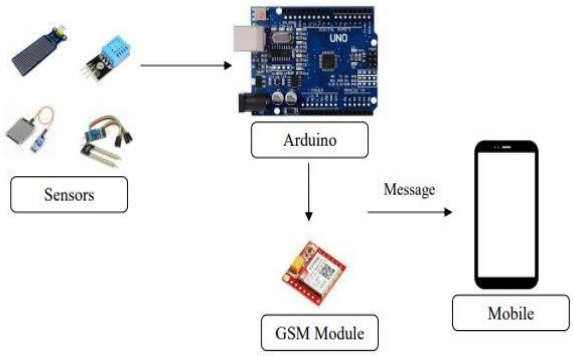



**Fig -6**: Module 2B – GSM Module – Sending Data

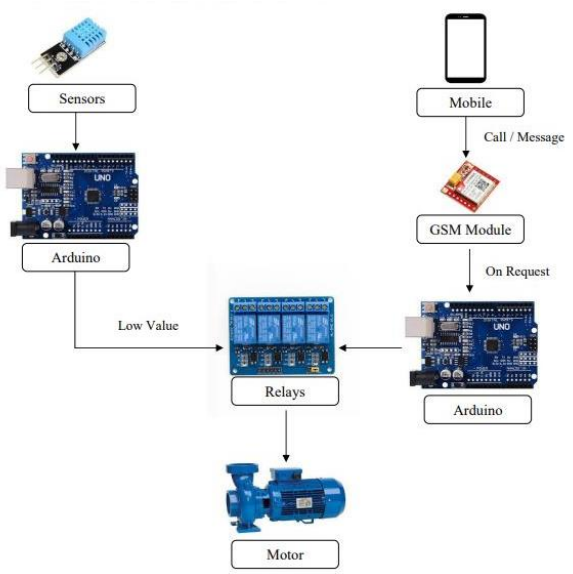



**Fig -7**: Module 2A – Motor Operation Module

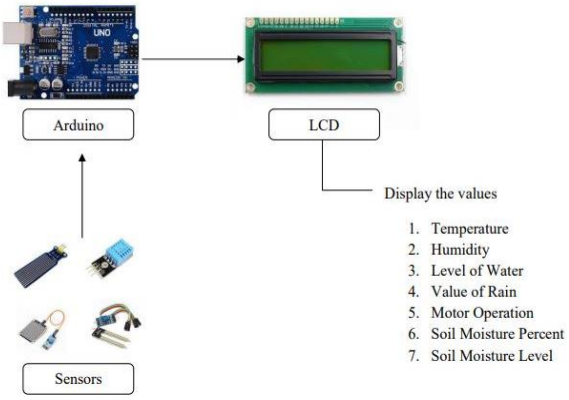



**Fig -8**: Module 4 – LCD Module

## 9. CIRCUIT

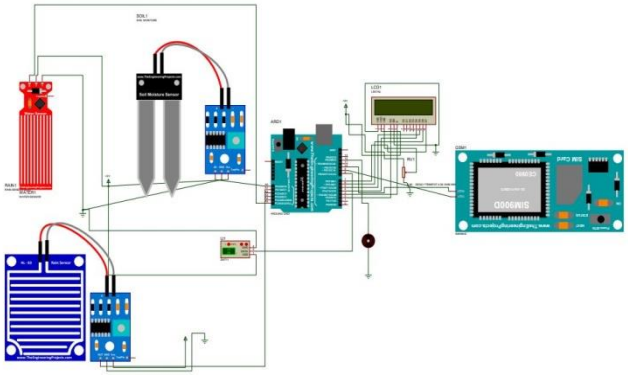
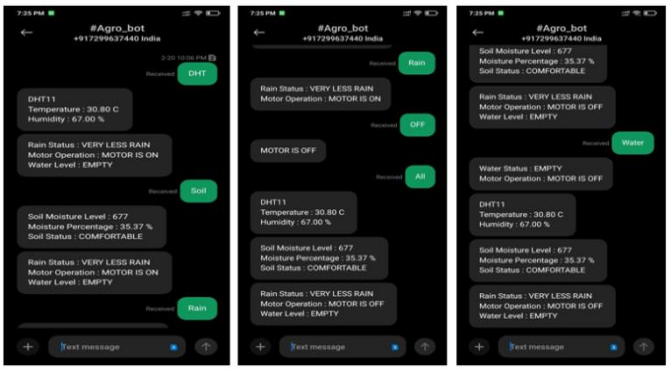


**Fig -9**: Proposed circuit for smart agriculture – automatic Irrigation using IoT and GSM

## 10. OUTPUTS AND DISCUSSION



**a** **b** **c**

**Fig -10**: Output sample of our proposed system

The output we received is via SMS only. As shown, in fig 10(a), the messages are received only when user requests the data. In Fig 10(b), the OFF message turns off the motor and the condition of motor is sent to the user. In Fig 10(c), the last three message is received when the user calls and hangs the call. Thus, with this output, its proven that this system only requires low signal and does not require any internet connection.

## 11. CONCLUSION

In this project, the data's are not stored in any external device, but the data's are transferred directly to the user's mobile via SMS. The data's can be requested via call or SMS according to the user. The smart agriculture system is always an ongoing trend and updates can always been done. Further upgrades such as sensing stick or other product based. This project serves a base for product based approach for any smart agriculture system.

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## REFERENCES

[1]. Abhiram MSD, Jyothsnavi Kuppili, N.Alivelu Manga, "Smart Farming System using IoT for Efficient Crop Growth", 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science

[2]. Durgesh Raghuvanshi, Apurva Roy, Dr. Vaibhav Panwar, "IoT Based Smart Agriculture System", International Journal of Research in Engineering and Science (IJRES), ISSN (Online): 2320-9364, ISSN (Print): 2320-9356, Volume 9 Issue 6, 2021, PP. 12-16

[3]. Fidaus Kamaruddin, Nik Noordini Nik Abd Malik, Noor Asniza Murad, Nurul Mu'azzah Abdul Latiff, Sharifah Kamilah Syed Yusof, Shipun Anuar Hamzah, "IoT based intelligent irrigation management and monitoring system using arduino", TELKOMNIKA, Vol.17, No.5, October 2019, pp.2378 – 2388.

[4]. Mr. CH. M.H. Saibaba, A. Kumar Sai Pavan, S. Manideep, K. Venkatesh, "Smart Agriculture system using Thinkspeak and Mobile Notification", International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 06 Issue: 12, Dec 2019.

[5]. A.P. Atmaja, A.E. Hakim, A.P.A. Wibowo, L.A. Pratama, "Communication Systems of Smart Agriculture Based on Wireless Sensor Networks in IoT", Journal of Robotics and Control (JRC) Volume 2, Issue 4, July 2021.

[6]. Aditya Pai, Siddham Shah, Ritik Bohara, "Smart Agriculture", EasyChair Preprint No 2699