IoT Based Smart Farm Monitoring System

R.Mythili, Meenakshi Kumari, Apoorv Tripathi, Neha Pal

Abstract: Internet of Things (IoT), a well-known branch of computer science has introduced smart farming to each and every farmer's neighborhood while offering constructive green agriculture. IoT depicts a self-configuring chain of components. The efficient implementation helps agriculture, a self-discipline as nicely as reducing human work and increasing crop cultivations. This paper endorses sensible IoT based Agriculture Stick as farmers aid by obtaining Live knowledge (Temperature, SoilMoisture) of farm data.These live readings help the farmers to try clever farming and to increase their average crop yields, also the quality of plants.The Smart Agriculture with Arduino Technology supports the farmers to control the live farm data and get the desired crop cultivation results.

Keywords: Internet of Things, Smart Farming, Arduino IDE, temperature and humidity sensor, Soil moisture sensor, PIR Sensor.

I. INTRODUCTION

Theupcoming generation of sensible Agriculture areoften undoubtedly based mostly on Internet of Things (IoT). Internet of Things (IoT) in recent times is taking part in a vital role of reworking "Traditional Technology" from homes to farms and workplaces to "Next Generation all over Comput

"Internet of Things"[9] is gaining an associate degree of crucial position in studies across the corner and corner of this international notably in location of up to date wireless communications. The phase, Web of Things refer to super identity of objects, matters and their individual digital representations in web like a structure. Internet of Things is applied in chain development and management by Kevin Ashton et.al [11].From industrial readiness purpose of IoT, these systemsare being utilized in enterprise management, production, good transportation and even in agriculture. Everyday some or different merchandise additionally introduces the devices to "Agriculture" during different stages of sensible and cleverness. Agriculture section requires furthermore necessary space globally forcreating certain meals security.Talking about the Asian nation farmers, they are currently in large quantity and are at degrading performance in terms of farm length, era, alternate, government rules, weather so on.

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No doubt,ICT based methods have solved some issues but are not enough utilized by inexperienced farmers and does not guarantee assured production. Agricultural productionentails many responsibilities like soil and plant trailing, environmental trailing of wetting and temperature maintenance, deliver chain management, infrastructure management, systems management, observation,and so on.
IoT primarily focuses all agricultural convergences that create high fee in phrases of outstanding, with increased production and decreased burdens.With continuous GPS and sensor data on agricultural field and integration of clever farming, instrumentality along with huge information analytics, farmers would be capable of improving crop production. And also, to build powerful use of water and reduced in flip wastage of any type during oversized stage.By, viewing this situation,agriculture of that is encircled by sizable amount of issues. It seeks substantially demand to possess good farming in todays' lifestyle so as to perform good farmingin actual IoT international bound.All products should be needed substantially upgraded and enforced at required time and conjointly at an occasional worth with right and required data.

II. LITERATURE SURVEY

A system using far flung sensors that screen exceptional situation of stages of environment like water degree, humidity, temperature, movement of animals, moisture content in soil, and so on. The Arduino UNO model at the side of GSM defend [8] is used.The field situation is dispatched to the farmer through mobile text messages.With this machine,sensor node failure and electricity saving are controlled.A machine is proposed for sensible agriculture monitoring [1][2] based totally on IoT era. The machine plays statistics shooting, processing, transmission and reception functions. The aim of their experiments is to realize smart agriculture device, in which the machine efficiency is to control the surroundings region and lower the cash and farming fee and also saves electricity. In a nutshell, the layout realizes faraway clever tracking and control of environmental conditions and additionally replaces the traditional stressed generation to Wi-Fi, also reduces manpower price.A system[3][4] is proposed for crop growth which can be monitored using thermal imaging technique. Here, the irrigation temperature distribution size (ITDM)technique [5] has been put into movement. In actual time, the captured information comprising of captured values gives better irrigation.

An approach [7] to assess using Wi-Fi module networks used in implementing automating farm system and facts are conveyed toArduino via conversation. The different sensors are implemented and used to experience the temperature measurement, humidity measurement, moisture measurement and hindrances for the crop tracking. when the brink values go below then only warning is given by sensor.

The farmer is used to be parallelly involved with the situations of field. It also describesfield framings. Moderate depth control also can be computerized in addition to irrigation [5]. Here, the forecast of crop quality as well as water requirements are not that much well organized.

In IoT [7][8] SMS alarm gadget is incorporated via GSM shield.

The device can capture environmental parameters along with temperature of air and humidity of air.In shorttime, with the use of AT command, this gadget can also realize SMS automatic sending and receiving,environmental situations overrun alarm and inadequate balance alarm. Through the device putting, the message can be dispatched to the user-special cellular cellphone automatically no matter what the customer'splace is. This gadget as a normal application of IoT inside the agriculture has got some efficient consequences in the real operation.

R.Suresh et al.[10] mentions, approximately using automated microcontroller based rain gun irrigation system in which the irrigation will take place only when there may be intense requirement of water that store a big amount of water. These structures convey a trade to management of subject area in which they developed aAndroid software stack. This stack includes a working device, middleware and key packages. The Android SDK supports the equipment and APIs need to begin growing programs at the Android systems using Java programming language. Mobile phones have come to be vital and essential part of us providing more than one wishes of humans. This application uses the GPRS function of cell phone as a solution for farm manipulated machine.Thesegadgets blanketed a small range of agriculture land and no longer economically low-priced. Indu et al. [12] in particular centered on reviews within the discipline of far off monitoring and manipulation, the era used and its capability blessings. This paper version proposes protection of GSM/Bluetooth [6] based totally human controlled faraway for irrigation machine.This device has set the irrigation time depending at the temperature and humidity reading getting fromsensors and specific kinds of crops and might automatically irrigation the sector whilst required.Information is exchanged between some distance factor and designed system through SMS on GSM community. A Bluetooth module is also attached with the principle microcontroller chip which gives message when the consumer or the farmer is in the constrained variety of small meters to the distanced gadget. The system gives statistics to the users or farmers about many conditions like popularity of multiplied temperature, water content material in soil and smoke via SMS on GSM network(Global System for Mobile) or via Bluetooth is done 98.50% accurately from other machine learning algorithms.

III. PROPOSED TECHNOLOGY

The Smart Farm Monitoring System is a mixture of hardware and software additives. The hardware part includes embedded systems and software program is the Arduino IDE.TheArduino IDE displays readings from sensors are inserted using the hardware.The special sensors used are temperature and humidity sensor, PIR sensor and soil moisture sensor. The facts gathered with the aid of the sensors are sent to the Arduino UNO microcontroller ATmega328.The gathered information may be displayed in an Arduino screen. A GSM module is hooked up with the

Arduino to facilitate messaging service which updates the farmers each 10 seconds approximately the climate conditions of the subject.

IV. HARDWARE USED

This project is aided with many hardware components. This proposed technology is an amalgamation of different sensors, microcontroller and communication medium to help the farmers to work on their farms.

A. Arduino UNO

Arduino is a microcontroller to control the working of the sensors and manage the working of the device. The UNO version of Arduino is implemented in this project. It was developed by Arduino CC. The Arduino board comes with various number of pins. The pins are categorized as output and input pins. The input pins accept digital as well as analog data. It has 14 digital pins and 6 analog pins. It accepts 7 to 20 volts of power for working. It also has an USB port. The U was the first version of Arduino to be introduced in the Arduino family.

B. DHT11 Temperature and Humidity Sensor

The DHT11 Temperature and Humidity sensor is used to sense temperature and humidity present in the atmosphere. It has 3 pins generally. One pin is used for transmitting signals, the next pin is used to receive signals and the last pin is data transfer. It can be used for prolonged time period. It gives approximate results. It regularly sends information to Arduino UNO. The information consists the signals which contain the values gathered about temperature and humidity. It is reliable on nature. It gives a very fast response.

C. Soil Moisture sensor

The Soil Moisture sensor is used to sense moisture content in the soil. It checks the volume of water content or moisture present in the soil. The calculations are done in the soil moisture sensor through coefficients. It estimates the volume of water content in the soil. It detects the water content in the soil and gets and sends the analog signals which is shown digitally. It transmits the signals containing information or data or values of the condition of soil to Arduino to further process it and display.

D. PIR Sensor

PIR sensor stands for Passive Infrared Sensor. It detects the movement around it and sends the signals accordingly. It radiates electromagnetic radiation. If any object comes within the range of this radiated electromagnetic radiation, the it hits the object and comes back to the PIR sensor telling that there is presence of an object in a specified range. An LED or Buzzer can be attached with PIR sensor so that the hindrance can be detected easily or the user will know of the hindrance easily. It will help the farmer to see if any animal has broken into field and is destroying crops. In this way the farmer can save his crops and lead to betterment in the quality of the crops. PIR sensor is used in burglar system also to detect if thieves have entered into an infrastructure. It is also called as PID.

E. *GSM Shield*

The GSM Shield is used as a method of communication in this proposed technology. The GSM Shield is used to send text messages to the farmer's cell phone about the conditions of the temperature, humidity soil and field area. A separate coding has to be done for GSM shield in Arduino.

It needs a SIM to implement it. More number of SIMs have to be fed in the coding. The number would belong to farmer to which the messages has to be sent. The values detected and transmitted by the sensors to Arduino is sent by the GSM to the cell phone. Hence it uses a network which does not require internet and overcomes the biggest loop hole of projects of this domain.

It can also be used to make voice calls. It is based on radio modem M10 Quectel. It incorporates AT Commands. It also has several pins to connect to. It uses TCP and UDP protocol for sending data packets. It uses HTTP which is HyperText Transfer Protocol.
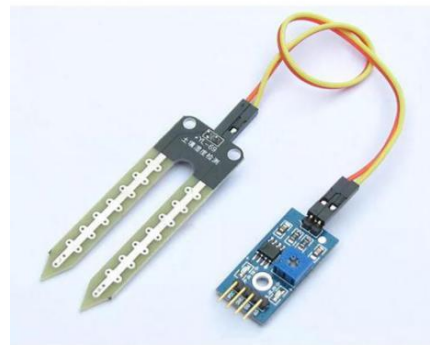
Table 1. Sensor Readings

Sensors	1	2	3	4	5	6	7	8
Temperature	0	65	55	53	48	66	67	62
Humidity	71	67	66	48	53	55	0	49
Moisture	35	34.21	37.24	35.87	38.51	34.7	33.63	59.34
Hindrance	1	0	1	1	0	0	0	1

Fig.3. temperature and humidity sensor
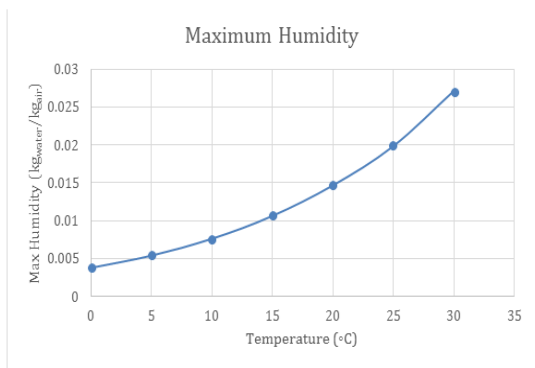
Fig. 1.Temperature vs Humidity

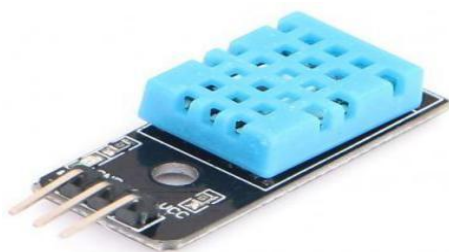Graph depicting temperature versus humidity ratings of sensors.

Fig 4. Soil moisture

V.   HARDWARE USED

A.   Arduino UNO

Fig.2.Arduino UNO


**Fig. 5. PIR Sensor**

Fig.6. GSM Shield

VI. RESULTS AND DISCUSSIONS

Based on the images and screenshots of the proposed working model presented in Section V and Fig.1, the advantages and salient features of the system are discussed in this section. It is very necessary and crucial for a farmer to have and implement this system in their fields.The system along with the sensors perform accurately.It is very easy to use and maintain.It has only development investments but low maintenance cost.It does not require internet connection to work. It can work without internet connection.The sensors detect the surrounding approximately and send it to the Arduino board.

The Arduino board processes the information and displays it on Arduino IDE.The results are also sent to GSM module so that it passes in the information or data or values to the farmer via GSM network.Here, the farmer does not need to have a smart phone, the normal cell phones also can work to share information with farmer from fields. This gives the biggest advantage to the proposed system.
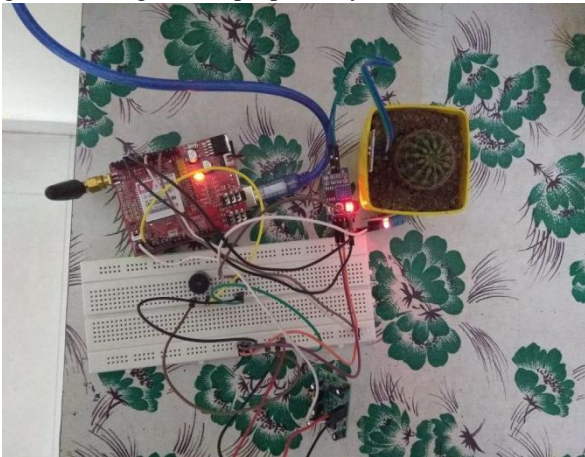
Fig.7. Experimental Setup
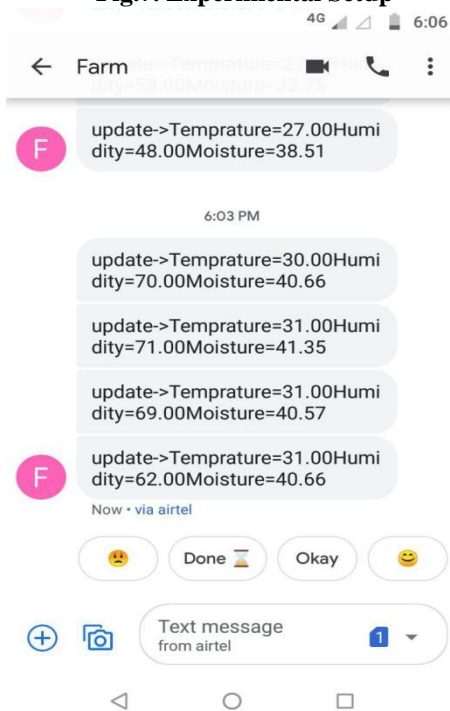
Fig.8. SMS in Mobile phone

VII. CONCLUSIONS

The Smart Farm Monitoring System can be used as destiny factors of agriculture. This would be a relief for farmers since it decreases the load of manual efforts. A gadget toscreen moisture levels within the soil changed into constructed and the assignment furnishes a possibility to take a look at the prevailing structures, at the side of their features anddownsides. The stated gadget may be used to turn on/off the water sprinkler in keeping with soil moisture levels thereby automating the irrigation technique of that is one of the most time ingesting activities in farming. Agriculture is one of the most effort-consuming hobby.The device makes use of statistics from soil moisture sensors to irrigate soil. Similarly, Live knowledge (Temperature, Moisture) of farm readings are experimented. The system helps the farmers to increase the average crop yield ratings, and plant quality through smart farming.

VIII. FUTURE SCOPE

The proposed assignment may be further greater with the aid of including pump to the machine to facilitate computerized irrigation. The automated irrigation device may be triggered when soil moisture content is going under the brinkstage. The threshold degree can be decided in the written Arduino code. Hence, whenever the fee for moisture goes under the brinkdegree, the pump gets mechanically on and the irrigation is performed.To improve the efficiency andeffectiveness of the machine, the noted recommendations can be placed into attention. Alternative of water level controlling, the pump may be given to the farmer by way of which they are able to turn on or off the pump to start or prevent the irrigation manner without being there on farm at that gift time. The farmer can knowearlier about the negative climate situations. In such instances, the farmer might also want toforestall the machine remotely or routinely. The concept of the usage of IOT for irrigation can be prolonged in addition to other tasks in farming together with farmanimal management, fireplace detection and climate manage.This could limit human intervention in farming sports.

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