Smart Farming using IoT

Project report submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology

in

Computer Science and Engineering
By

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Under the supervision of

Dr. Hemraj Saini

to

Department of Computer Science & Engineering and Information Technology
Jaypee University of Information Technology Waknaghat, Solan-173234, Himachal Pradesh

Candidate's Declaration

We hereby declare that the work presented in this report entitled "**Smart Farming using IoT**" in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science & Engineering** submitted in the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology, Waknaghat is an authentic record of my own work carried out over a period from August 2016 to December 2016 under the supervision of **Dr. Hemraj Saini** , Associate professor, Computer Science & Engineering.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

(Student Signature) (Student Signature)

Sonam Menda (151439) Chechey (151438)

This is to certify that the above statement made by the candidates is true to the best of my knowledge.

(Supervisor Signature)

Dr. Hemraj Saini

Associate professor

Computer Science & Engineering

Dated:

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Acknowledgement

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We are also grateful to **CSE project lab staff** for their practical help and guidance.

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List of abbreviations

- ICT : Information and Communication Technology.
- IT : Information Technology.
- CSE: Computer Science and Engineering.
- PWM: Pulse Width Modulation.
- DIP: Dual Inline Package
- AVR: Alf and Vegard's RISC processor
- LM: Linear Monolithic
- SN: Sensor
- ITDM: Irrigation Temperature Distribution Measurement
- CF: Conversion Factor

Abstract

Farming is backbone of economy and it is the fundamental method for occupation. The large population of world depends on farming for living day to day life. Around 70% of Indian population depends on cultivation and moreover many of the crop cultivation are contributed from here. Most of the cultivation cannot be productive only by physical activities so have to be handled by innovative technologies. Therefore, we use IoT innovation to address the critical part of farming.

The past method of incorporating keen water supply system with smart idea.
In this method, we utilize IoT ideas to address certain essential whch deals with critical parts of cultivating. This undertaking is a follow up to a past method whose highlight features incorporates keen water system with excellent control and insightful basic leadership in terms of exact continuous field information which regulates temperature, moisture and soil dampness of a particular crop. Controlling of every one of these activities will be monitored by PC with Internet and the tasks being performed by interfacing sensors and Arduino. With the observation results decision are to be made.

Chapter-1

INTRODUCTION

1.1 Introduction

In this modern world, most of the farmer lack proper knowledge regarding farming and agriculture making it more erratic. Most part of farming and agricultural related activities are based on prediction and forecasting. When it fails, the farmers have to bear huge losses and some end up committing suicide. Since we are aware of the benefit of quality of soil and air, irrigational and in the growth of crops such parameters such as temperature, moisture cannot be neglected.

Internet of Things was introduced in 2009 and it aims in incorporating all gadgets and devices to the web. "**The Internet of Thing**" is changing every second. IoT enhances our lives in terms of business; medical-health and society by modifying products which are IoT based making our life easier. It is predicted that by 2020, '50 billion devices will be connected to the web and the market will be worth of $14 T'.

Internet of thing is an emerging topic of technical, social and economical development. Products like consumer items, big machineries, vehicles, mechanical and utility segment, sensors and others are connected to internet availability giving necessary information that guarantee to change the manner in which we work making our life simpler.

There are five hottest topics of computer in this modern world. These are IoT, Big Data, Cloud Computing, Data Mining and Cyber Security. IoT is one from this topic and this is mostly related to device. It is advance automation and analytic system which is based on physical device. IoT system is unique from rest of the system and is more flexible since it enable many automate features and value. These devices mostly use sensors, AI, and other

electronic device. It is upcoming topic in computer world and they are not world widely in used. Some are under implementation and some are under observation.

The Second Green Revolution-

After the world war, farming spared in excess of a billion people from starvation. Presently, a second upheaval, manufactured generally on advances that contain the Internet of Things, guarantees to make the ranch of things to come more beneficial and effective.

Technologies such as sensor and monitor can help farmer to monitor crop quality continuous and more accurately.

The following time for Smart Computation will be completely founded on Internet of Things (IoT). IoT has assumed a significant job of changing "Customary Technology" from homes to workplaces to "Cutting edge Everywhere Computing". It will make our life easier by making more efficient industries, smarter cities, connected car, etc.

What is smart farm?

Smart farming technology is the use of iot which connects devices such as arduino with the sensor and performing task such as getting reading from the arduino software and making decision according to it .it helps in the temperature, humidity, ph scale management. We also have some feature used by the farmers such as-

Robotics

Data analytics using graph analysis

Data mining using markov chain

Agricultural stick

GPS sensing motors

Tools used in IoT technologies in present date

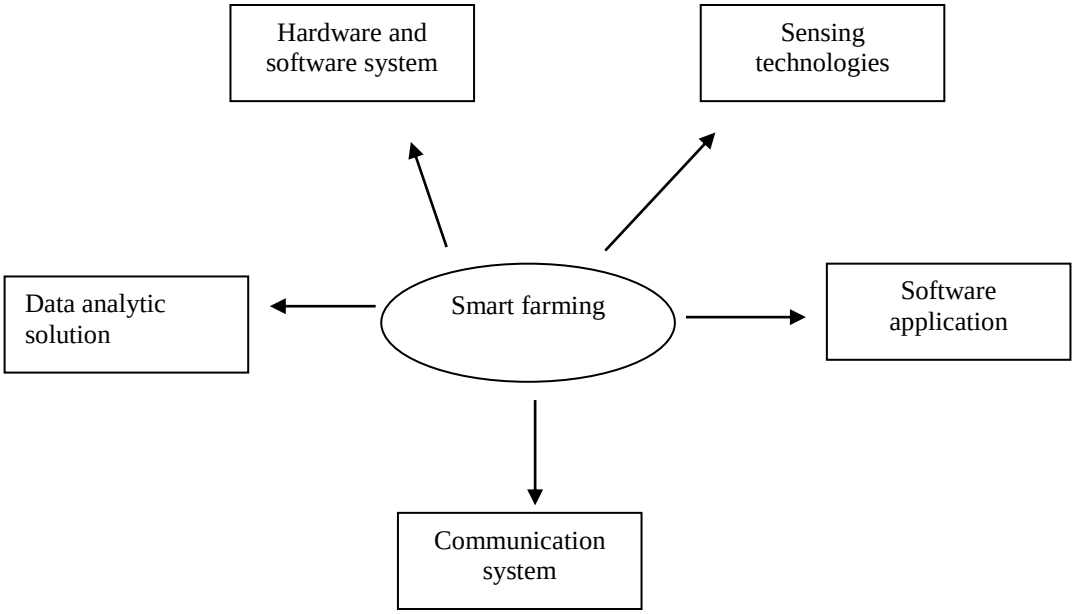

Fig.1 tools used by IoT in smart farming

The above cited fig.1 depicts that through smart farming concept, we can enhances the software application, communication system, provide solution to data analytics, uses hardware and software systems like agricultural stick, sensors like temperature and soil moisture sensor. Software application used is Arduino IDE which takes data and display in arduino board.

This also builds up communication system between the sensors and the user in a form of notification.

1.2 Problem statement

The method for using technologies in farming and cultivation requires knowledge of deep learning about the agricultural procedures and science. Many factors must be considered and investigated deeply while constructing a system that should make best cultivation process making agriculture system more effective and sustainable. In order to make agricultural system more precise that can be used by many farmers and can be applied in different context. We should be ready to answer questions like

- Is it achievable to build a structure that will accommodate every possible situation in agriculture context?
- Is automation function in agriculture helpful and in which part of cultivating process cans it is applied?
- What is the overall expenditure and benefit of using cultivating process and how it can be minimized by automating this process?
- What are the components needed/ required while designing smart farming techniques?
- Which component of this process is most expensive and how can it be minimized? How and how much can it be minimized?
- Are geographical factors like temperature, mineral content of soil, moisture content, location and season sufficient enough to make difference in the rate of cultivation?

- Which parameters are taken care of while cultivating

The above mentioned doubt cannot be clarified even by specialist since horticulture science deals in multidisciplinary field and all above aspect have to be taken in account while taking decision. Furthermore, research in agriculture is directly linked to local areas. Climate and soil property of one place is different from one another.

Climate change and transformation of plant and soil are uncertain. It occurs as time passes, thus making successful and sustainable cultivation

1.3 Objective

Agriculture is the most labor intensive a important field of occupation.
Migration of labor from rural to urban affects agriculture

So we need smart farming to –

• To enable farmers with technology

If farmers are well learned and have great knowledge about the advantages of using particular technologies, then they will have more interest in using technologies and doing farming work. They will educate other too about this things and the user will increase rapidly. Therefore, there is high chance of reducing the rural-urban migration which has many advantages such as solution to crowded population in urban area, solution to pollutions (soil,air,water,noise,etc). Noise pollution is one of the major problem in this urban cities.

• Increase output

If farmer are well informed about farming activities like when to plant particular crops, vegetables and more. And also how much soil contains moisture and when to water. Then they will not make mistake is cropping and planting any things. Thus they will have greater output. Through IoT we can inform farmer about this things.

• Stabilize growth

Stabilize growth means to maintain stable agricultural and other farming activities. Since there are high probability of facing food crisis, price crisis and most probably the economic crises. Farmers can stay stable during such crises if they have proper knowledge

and method to do farming. With the use IoT we try to help farmers to solve many problems.

• Sustain farming

Sustain farming means the system of plant and animals production that will last for the long term having minimal side effects. For example to satisfy human food we need to enhance environmental quality and naturals recourses but without any technologies and systems we cannot meet the demand of this. So IoT helps in meeting demand of this sustain farming.

1.4 Methodology

In this project, we are using sensors which include temperature and soil moisture. Here we set limit to water level and fix it in required amount. Soil moisture sensors are fixed under the ground in field . Initially the water level reading is taken and decisions are made according to it.

The temperature sensor (DTH11) is fixed at the centre of the field to get the overall reading of temperature of the soil. Readings are taken in Degree and Fahrenheit. These sensors are connected to Arduino where we will get the readings.

All sensors will send data to Arduino and data will be forwarded to raspberry pi. The threshold value will be set according to the crop. The threshold value will be marked based on the requirement of the crop specified and predefined in the raspberry pi for every sensor. Whenever any sensor reaches a threshold value, message alert is sent to the user and action is taken according to it.

1. Study about the parts of tool.
2. planning of model
3. collection of readings from sensor
4. Execution of model.

Chapter 2

LITERATURE REVIEW

IoT BASED SMART AGRICULTURE [1]

"Prof. Nikesh Gondchawar & Dr. R. S. Kawitkar, Electronics and Telecommunication, Sinhgad college of Engineering), Pune, India"
Publication date: June 2016

Integrated system deal with all elements influencing the profitability. The method aims in making horticulture excellent by efficiently utilizing computerization and IoT which uses GPS based remote controlled robots to perform field work such as weeding, splashing, dampness detecting, winged creature and creature startling, keeping carefulness, and so forth .

Excellent watering system with keen control and smart leadership depend on exact constant field information. It additionally incorporates keen distribution center, for example, temperature upkeep, dampness support and burglary discovery in the stockroom by Controlling every of these activities will be finished by any remote gadget / PC associated with Internet and the actions will be performed by interfacing sensors, ZigBee modules, camera and actuators with small scale controller and raspberry pi.

Demerits by these projects are:
Its expensive to use in actual field although it's automotive and quick process.
It causes weakening of radio recurrence (RF) signals by the organization of sensors dirt.

IOT BASED SMART CROP MONITORING IN FARM LAND[2]

"Naveen Balaji.G ,Nandhini.V , Mithra.S , Priya .N , Naveena. R- Assistant Professor, Department of ECE, SNS College of Technology, Coimbatore, TN – INDIA. - UG Student, Department of ECE, SNS College of Technology, TN – INDIA."

Publication: November 2018

It uses sensors that check different conditions of environmental factors like water level, humidity, and temp. etc., the processor along with IC-S8817BS and wireless transceiver module with Zigbee protocol is used. The field condition is sent to the farmer via mobile text messages and email from the experts. With this system SN fails and energy are managed efficiently. Zigbee technology is used which sometimes lack in range of communication. A system is proposed for green agriculture using Zigbee technologies. This model performs data processor, trans. and receiving function. The aim of the project is to understand smart farming system using green house, where efficiency of the system is to manage the environmental factors and decrease the faming overall cost and to save energy. Here it uses (BS structure and cc2530) which acts like processing chip for wireless sensor node. It uses Linux Operating system and the cortex A8 processor as a core. The design is all about remote intelligent monitoring and control of green house which replace the tradition wired smart house technology to wireless. It also reduce man power cost. A system is proposed for plant growth which can be monitored using thermal imaging technique. Here the irrigation temperature distribution measurement (ITDM) technique has been implied. In real time the thermal images comprising of both low and high temperature ITDM values gives better irrigation. Thermal imaging can provide temperature value of all pixels in the field when compared to thermometry which only provides an average value. For temperature which is very close in range, thermal imaging leads to inaccurate information so that the objects can become in differentiable. A method to evaluate the use of wireless sensor network used in automating irrigation and data are sent to the web application server through communicating wireless.

The sensors are used to sense the temperature, humidity, moisture for crop monitoring. The irrigation is automated when the sensor reading goes below the threshold values. The farmer is regularly intimated with the field conditions. It also explained that in greenhouses, intensity of light can be controlled and automated in addition to irrigation. Here, the prediction of crop water requirement is not efficient.

IoT based smart sensors agriculture stick for live temperature and moisture monitoring.[4]

Anand Nayyar & Vikram Puri (Duy Tan University)

Publication: November 12, 2018

This aims in giving an efficient monitoring of environment which will help the farmers to do smart farming increasing their overall yield and quality of products. The Agriculture stick being proposed in these project is integrated with Arduino Technology, Breadboard interfaced with various sensors providing live data feed online from Thingsspeak.com. This project gives 98% of the accurate data using the live agricultural stick tested on Live Agriculture Fields.

Management of crop water

To perform agriculture activities in an efficient way, adequate water is needed. In this approach the agriculture IoT is interfaced with Web Map Service (WMS) and Sensor Observation Service (SOS) to ensure water is properly managed for irrigation which in turn reduces water wastage.

Precision Agriculture

The weather information provided by this method should be high so that it reduces the chances of crop damage. Here agriculture IoT ensures in time delivery of real time data in terms of weather forecasting, soil quality, labor cost and much more to the farmers.

IPM/C -Integrated Pest Management/Control

In this, agriculture IoT systems assures that farmers with accurate environmental data via proper live data monitoring of temperature, moisture, growth of the plants and level of pests so that proper care can be given during production.

Food production & Safety agriculture

It accurately monitors various factors like temperature of warehouse, shipping transportation management system and integrates cloud based recording systems.

Other projects implemented till date are:

a) the phenonet project using open iot

b) claas equipment

c) precisionhawk's uav sensor platform

d) cleangrow's carbon using nanotube probe

e) temputech's wireless sensor monitoring.

Smart Farming using Internet of Thing[3]

" Rathinkumar. H. Kothiya Department of Information Technology,

Chandubhai S. Patel Institute of Technology, Charusat University, Anand, Gujarat, India."

"Karan L. Patel Department of Information Technology, Chandubhai S. Patel Institute of Technology, Charusat University, Anand, Gujarat, India."

"Prof. Hardik S. Jayswal (Research Guide) Assistant Professor, Department of Information Technology, Chandubhai S. Patel Institute of Technology, Charusat University, Anand, Gujarat, India."

Publication: November 2015

This aims in the equipment of different sensors for measuring environmental parameters required for the growth of crops. It includes node MCU and different sensors for executing and performing the whole process. The features used in this system is to gather all the environmental data and give accurate data to the farmers so that they can take most efficient decision related to farming. The system will perform tasks such as sensing the soil moisture, temperature, and humidity. It also indicates water level, detecting an intruder in the field and performing automation functions i.e switching an electric motor on/off manually. The system which is proposed has been tested, monitors the reading and obtain satisfying results which will enable the system to be very useful in smart farming.

The sensors give reading such as the temperature reading, humidity reading, soil quality and water- level. It gives automation setting such as fan when the temperature is high giving status on and off and motor for sending water to plants.

SMART FARMING USING IOT[5]

"Hariharr C Punjabi, Sanket Agarwal, Vivek Khithani and Venkatesh Muddaliar"

Student, Department of ECE & Telecom, VESIT Mumbai University, Mumbai, Maharashtra, India

"Mrugendra Vasmatkar"

Assistant Professor, Department of Electronics and Telecommunications, VESIT Mumbai University, Mumbai, Maharashtra, India

Publication : November 2015

in this paper it mainly focuses in simple irrigation using IoT technoloies.

It uses the concept of iot and data mining.

it solves the current problem of the farming methodologies and provide with the practical solutions.

It uses features like GSM module which comes with the idea of updating farmer with the live conditon of farm on the mobile device and present using graphical analysis.it also evaluates performance by using simple temperature sensing device.

S/No	Research paper	Features	Benefits	Limitations
1	IoT based smart agriculture	Using automation in IoT and GPS remote robot system	Accurate data prediction	Expensive and difficult to get the hardware.
2	IoT in agriculture	Through help of markov chain, it gives ideas about what crop is best suited for	Use of ir and dm concept.	Inappropriate value of data as interpreted through graph analysis
3	IoT based smart sensors agriculture stick for live temperature and moisture monitoring.	getting accurate live feed of environmental temperature and soil moisture	let us know the condition of the environment parameters.	Costly to design
4	Farming using IoT	Use of sensors and by enabling the automation concept.	Helpful in making decision.	Difficult in large scale production.

This process makes the work hand and convenient. It also reduce the effort for human to go to the actual farm and monitor it manually

From the research papers we have referred, we have considered features like message alert features in whatsapp using raspberry pi, getting reading from the sensors from arduino IDE and making decisions according to it.

Chapter-3

SYSTEM DEVELOPMENT

3.1 System Overview

The system contains two sensors, one Arduino Uno R3, power supply from pc and Raspberry pi. The raspberry pi act as a motherboard and Arduino R3 as microcontroller. The readings from the sensor are displayed in the arduino IDE software and is notified in in form of message via whatsapp application.

Temperature sensor (DTH11)

It has three pin

1. Power supply Vcc 3-5V
2. Output/Data
3. Ground

The first pin(power supply) is connected to arduino pin with 5 v, second pin (output data) with A1 port of arduino which reads the data and ground is connected to the ground of arduino.

Soil moisture sensor.

To measure the wetness and the water intensity we use soil moisture sensor and the connection is done through this steps.

Connect two pins from soil moisture sensor with the two pin of raspberry pi using hooked wires. Connect Vcc (source voltage) from raspberry pi to the arduino and ground pin to

Gnd pin on the arduino. We use analog data by connecting the analog data pin A0 on the arduino to get the reading.

Arduino Uno R3

"Arduino Uno R3" is a microcontroller based board version of ATmega328P and consist of 20 pins (6 as PWM output and 6 as analog input). It has everything needed to support the microcontroller. It uses c and c++ in arduino IDE.

3.2 System Architecture

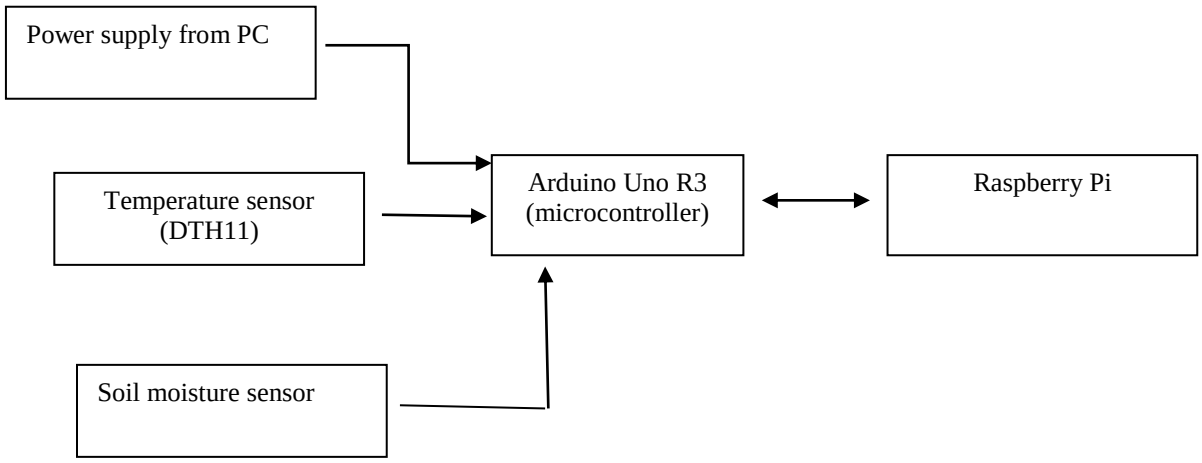

Fig. 2 System Overview

The fig.2 depicts how the over system will look like. We have used four hadwares i.e temperature sensor,soil moisture sensor, arduino uno R3 and raspberry pi.

The sensors are connected to the arduino with the help of jumper wires and same with the rasbpberry pi.The power supply is provided by the laptop /computer used using USB cable.

Single arrow shows that the sensor readings are to be taken by the arduino and the decision based analysis is arduino so is done by the raspberry pi as well as arduino so is denoted by bi directional arrow.

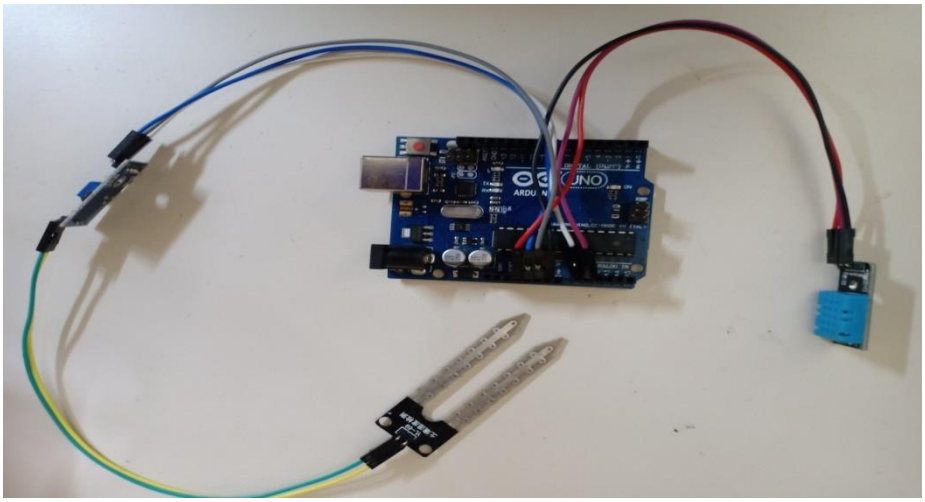

Fig. 3 system overview with Arduino

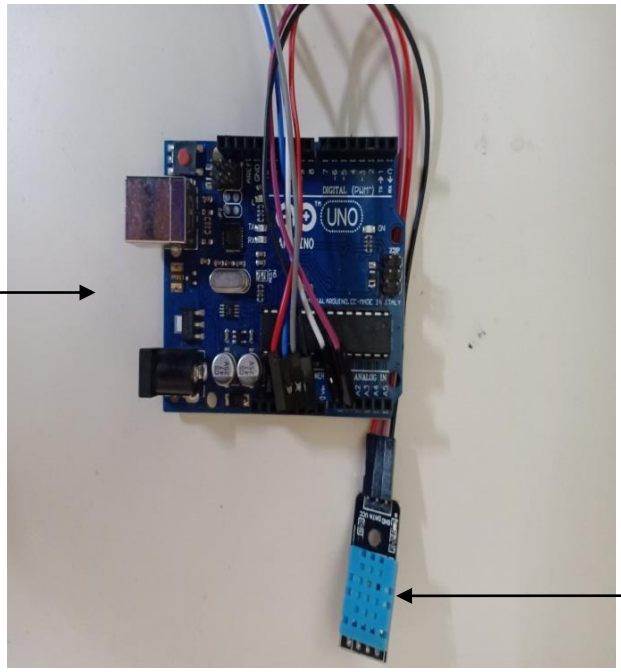

Fig. 4 Connection of Temperature sensor with Arduino

The DTH11 yield voltage straightly relative to the Centigrade temperature of 5 v. It has three terminals which measure temperature ranges from -55 degree Celsius to +150 degree Celsius. The output volt of temperature sensor (DTH11) rises 10mV per degree

Celsius, it can be operated from 5V power supply with less than 60uA of current. The output pin of DTH11 is shown in the figure above.

Terminal 1(black) connected to ground, terminal 2(pink) connected to A1 pin which gives output and terminal 3 (red) is connected with power supply of 5volt as shown in Fig.4

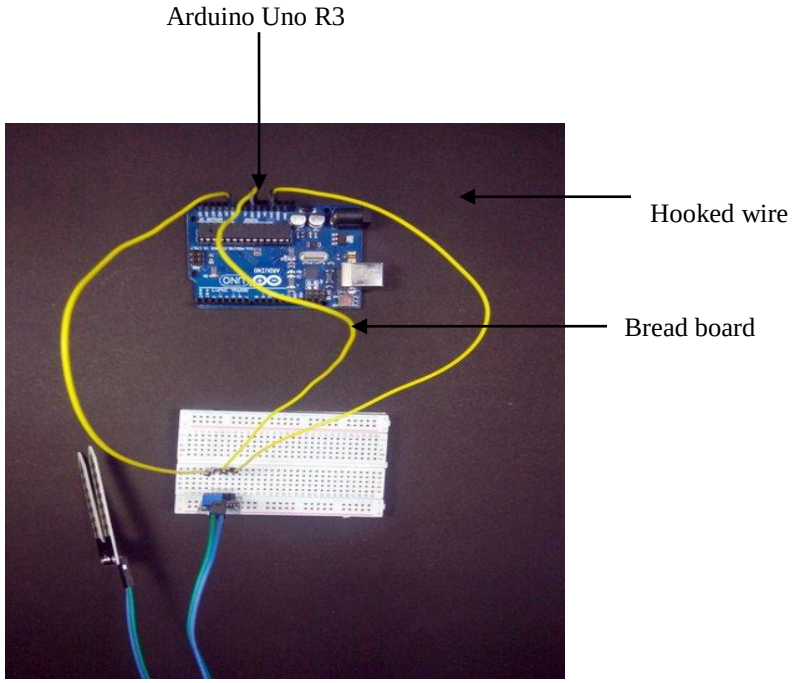

Fig. 5 Connection of Soil Moisture sensor with Arduino

3.3 Hardware and Software used

Hardware

1. **Arduino Uno R3**

The Arduino Uno R3 is a removal, DIP, ATmega328, AVR microcontroller based board. It consists of 20 pins (6 as PWM output and 6 as analog input) as shown in fig.6. Codes are loaded from Arduino. It accepts support for extensive community, which makes it easy to start working with embedded C language.

Fig.6 Arduino Uno R3

2.**Raspberry pi**

The Raspberry Pi is a low cost CPU which act as a mother board for our project using standard keyboard and mouse. The language which are used by the raspberry pi are Scratch and Python. The below picture illustrate how raspberry pi looks like.

Fig. 7 Raspberry Pi

3. **Temperature Sensor DTH11**

- maximum voltage supply of 5 V

- Temperature ranges from 0°C to 50 °C giving error of ± 2 °C
- Humidity ranges from 20 to 90% RH ± 5% RH error
- Interface is Digital

DTH11 is a cheap temperature cum humidity sensor which increases linearly with every incline change in temperature.it is illustrated by fig.8

Value of actual temp = Value * CF

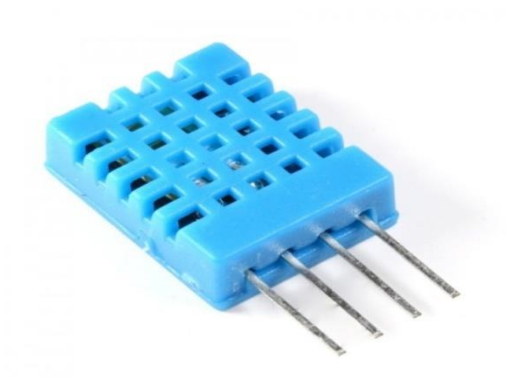

Fig. 8 Temperature Sensor (DTH11)

5. Soil Moisture SN

The soil moisture (moisture content in soil) is detected by soil moisture SN. It is based on electrical resistance of soil. The environmental factors like soil quality and humidity may differ. We use automation function switching water pump ON/OFF by sensing the moisture content in the soil and getting the reading from the microcontroller

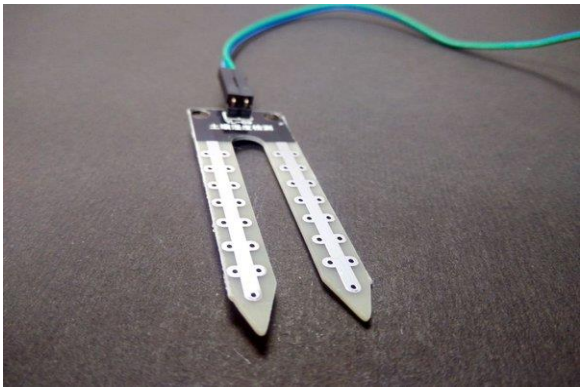

Fig. 9 Soil Moisture sensor

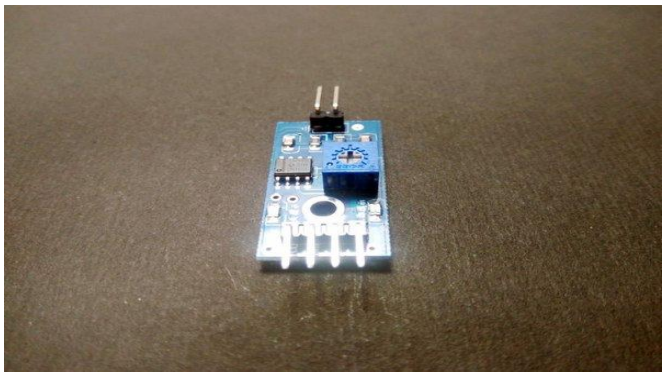

Fig. 10 Soil Moisture detector probe

The soil moisture sensor which has two pin is connected with the detector probe with four pins. Out of four pins three pins are connected with the arduino (Blue,Grey & white) The blue and grey wire connected with the ground and the white with the Vin of the arduino.

6. Bread Board

Breadboard is equipment that is used for connecting integrated circuits and registers. It helps to test and build circuit connection. The breadboard has many holes (horizontal and vertical) into which registers and IC chips are inserted.

Fig. 11 Bread board

7. Jumper Wire/ Hooked wire

Jumper wire and hooked wire is an electrical cable used in an Iot application for interconnecting arduino with different sensors with the bread board..It is normally used for making connection between components like Arduino (pin) with the Temperature sensor and Raspberry pi. It helps in completing the circuit giving the readings.

Fig..12 Jumper Wire

In Jumper wire, we have three category

Male to male

Male to female

Female to female

Number of wires used:

Male to male: 15nos.

Fig..13 Male to male jumper wire

Male to female : 15 nos.

Fig..14 Male to female jumper wire

Female to female: 15 nos.

Fig..15 Female to female jumper wire

8. USB Cable

The usb cable connects the aruino hardware with the power supply mode here in our case we use PC

Fig. 16 USB Cable

System should be compatible to

CPU: 2.2 GHz processor and above

RAM:4Gb or above

OS: Windows 7 or above

Software Requirement

For software application, we require

1.Arduino IDE

Is a single microcontroller designed to execute applications such as getting reading from the arduino and various microcontroller.

2. Ipython

Is used by the raspberry pi hardware to be connected with the arduino to siplay the communication purpose i.e provide notification.

Chapter -4

ALGORITHMS

Temperature sensor DTH11

Steps:

1. Assigning analog pin A5 to sensor

2. Store temperature in degree Celsius

3. Store temperature in Fahrenheit

4. Configuring sensor pin as input

5. Reading the value from sensor

6. Output voltage = (vout *500) / 1023;

7. Storing value in Degree Celsius

8. Temperature in Fahrenheit = (Vout*1.8) + 32 (Converting degree celsius to Fahrenheit)

9. Temperature display in Degree and Fahrenheit in the pc

Soil moisture Sensor

Steps

1. Initialize serial communication at 9600 Bps.

2. Read the input on analog pin 0

3. Get the value you read

Chapter -5

TEST PLAN

Plant used : Aloe vera plant

Automation function by Sensor

Conditions:

Temperature Sensor

Optimum temperature: 30 Degree C

Minimum temperature: 13 to 27 Degree C

Email alert if temperature rises above 30 Degree C or drop below 10 Degree C

Soil Moisture Sensor

Optimum water content: 60 %

Email alert if it goes above 60% or below 55%

Display of temperature in Degree C and Fahrenheit

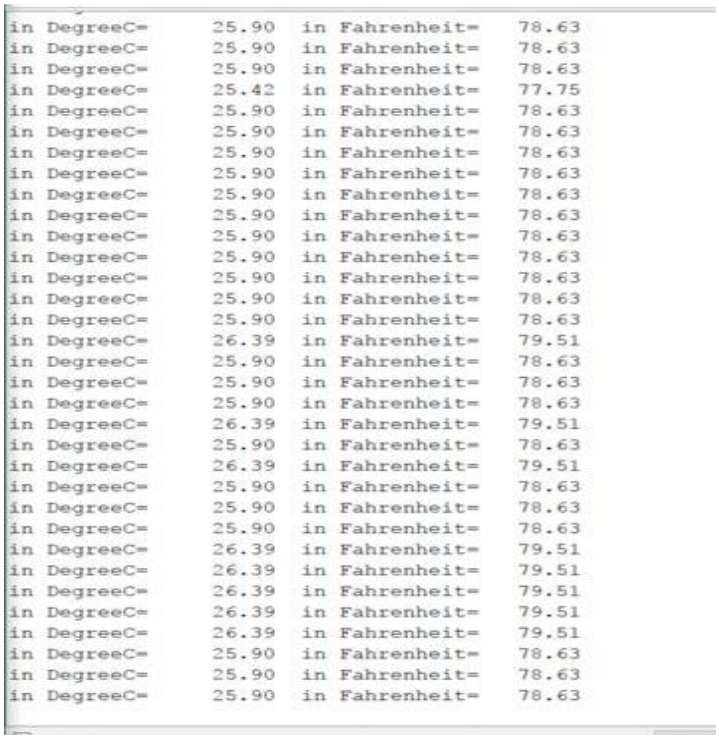

Fig. 17 Output displayed by the Arduino software

Output By soil moisture sensor

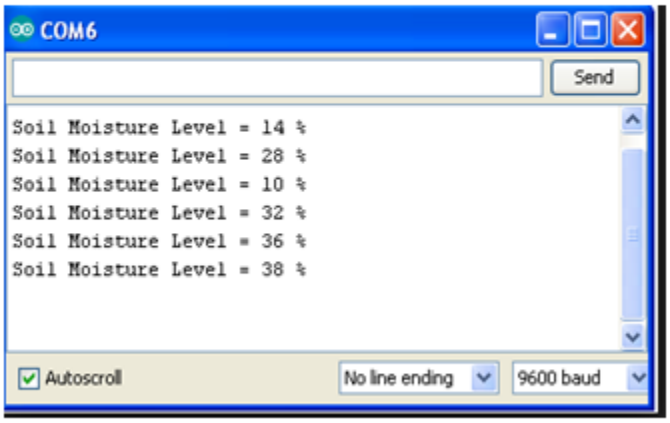

Fig.18 Output by soil moisture sensor

Output by temperature sensor

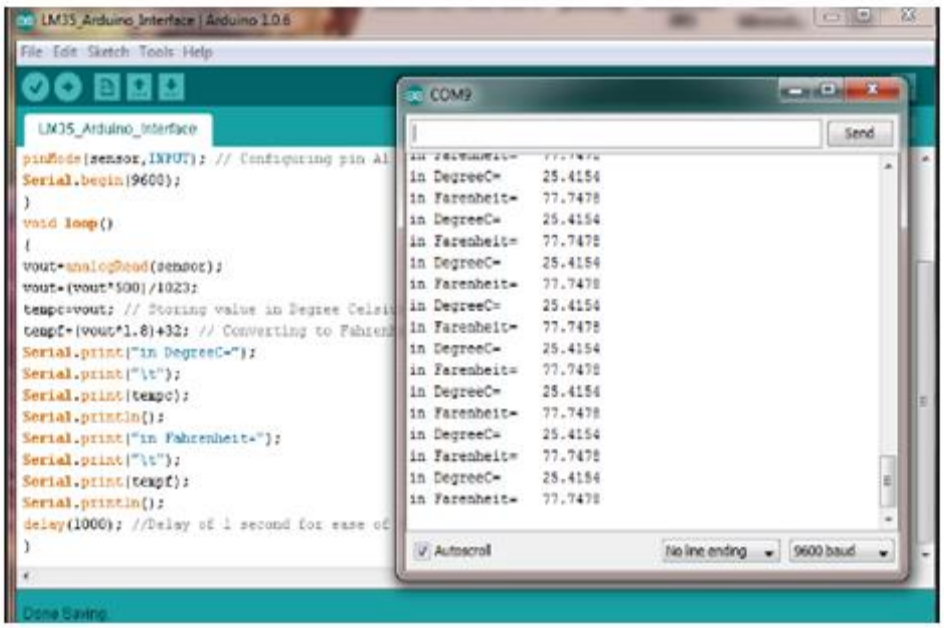

Fig..19 Output by temperature sensor

Graph Analysis

Time	Temperature(C)	Moisture content(%)
10	25	14
20	26	28
30	28	32
40	28	10
50	31	36

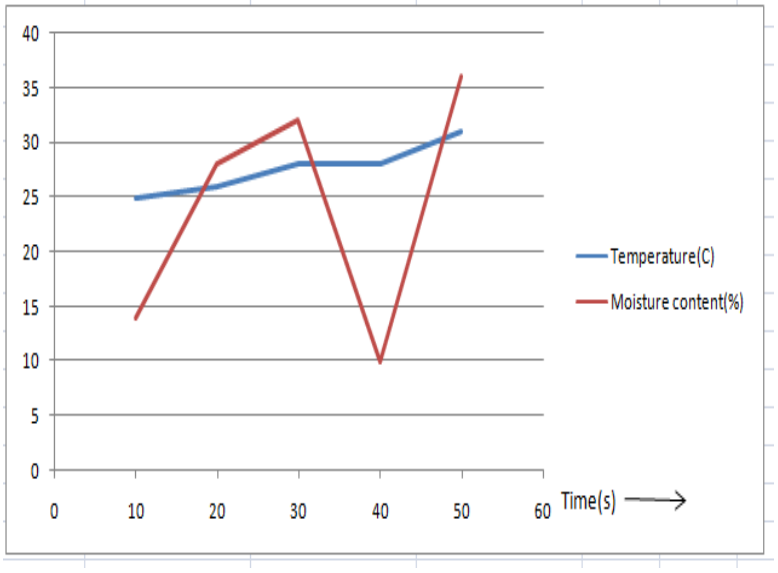

Fig..20 graph of two sensors

The above graph illustrate the two data set i.e Temperature(C) and moisture(%) in given interval of 10 s. The maximum value of temperature is 31 degree C and maximum value of soil moisture content 36%.

From above fig.20 we will come to know the changes of temperature and soil moisture with respect to time. For example soil moisture content start from 15% and increases rapidly till 32% and decreasing down to 10%. The zig-zag movement of slope shows the how many water the particular crop is having or not. From there we know when to water and when to pump out the water. The slope of temperature doesn't change much since temperature changes slowly. If graph value of slope (red) is very low, we should immediately water the plants and vice versa.

The fig.17 is the output displayed by Arduino Software, fig.18 is output displayed from soil moisture sensors and fig.19 is output displayed from temperature sensor that we have used.

Chapter -6

RESULTS AND PERFORMANCE ANALYSIS

6.1 Benefit of using Raspberry pi and Arduino

A Raspberry Pi is a very different machine. It is an appropriate PC with a working framework, and record framework hung on a glimmer drive. We can plug in keyboard, mouse and monitor. It acts like a web browser. It has a faster speed for a processor 900MHz and memory of 1GB RAM. The problem with this is it takes a long time of 10 seconds for a start up process. Arduino runs with the application of power and its cost is less than arduino but less than Intel Galileo.

For handling photos and videos we use raspberry pi such as for security purposes and media server. Galileo is best used in productivity and monitoring since t has a real time clock but it cannot be easier to implement without analog to digital converter.

Advantage of Arduino Uno R3

1- Easy to Use:

The most favorable architecture of Arduino is that its predefine to utilize. Arduino come in an bundle frame which compose of the 5Vcontroller, an oscillator, a smaller scale controller, sequential interface, LED and headers for associations. It is handy and no software is required. We simply plug it into USB port of PC.

2-Examples of codes:

Another huge favorable position of Arduino is its library of models present inside the product of Arduino. We'll clarify this favorable position utilizing a model of voltage estimation. For instance in the event that you need to gauge voltage utilizing ATmega8 small scale controller and need to show the yield on PC screen then you need to experience the entire procedure. The procedure will begin from taking in the ADC's of small scale controller for estimation, experienced the learning of sequential correspondence for presentation and will end at USB - Serial converters. On the off chance that you need to check this entire procedure tap on the connection beneath.
DC voltage estimation utilizing Atmel AVR miniaturized scale controller. Then again, on the off chance that you need to gauge the voltage utilizing Arduino. Simply plug in your Arduino and open the Read Analog Voltage precedent. The undertaking is prepared subsequent to putting some sensible resistors and zener diode. You can without much of a stretch see the voltage on the Serial terminal of Arduino.

3-Effortless capacities:

while coding in Arduino IDE, we see a few capacities which make the life so simpler. Other preferred standpoint of Arduino is its programmed unit change capacity. You can state that while investigating you don't need to stress over the units changes. Simply utilize your power on the fundamental parts of your ventures. You don't need to stress over side limitations.

4-Large people group:

There is multiple gathering available on the web where every user are using Arduino. Computer experts and specialist are making their ventures using Arduino. With not much knowledge required, it helps to discover about everything and every single thing about Arduino.These are explained by the Arduino site i.e Arduino IDE.

Thus, we conclude by saying that if we have a creative design plan then every work will be done by the Arduino itself.

5. Cheap:

Arduino boards are relatively not expensive compared to other microcontroller like intel galielio. The least expensive version of the Arduino module is arduino uno R3 can be assembled easily with the pre-assembled Arduino modules cost less than $50.

6. Cross-platform:

The Arduino IDE software runs on Windows, and Linux OS. Most microcontroller systems are limited to Windows.

7.Open source Tool and Extensible Software :

The Arduino software is considered as open source tools and it is available by experienced programmers for extensions. The language can be expanded through C and C++ libraries and people wanting to known the technical information can make the leap from Arduino to the automatic voltage regulation (AVC) C programming language on which it's based. You can add AVR-C code directly if you want to into your Arduino programs.

8. Open source and extensible hardware;

The Open source and extensible hardware are arduino which are based on Atmel's ATMEGA (8&168) microcontrollers. The modules are made under a Creative Common license, so that they can make their own design version of experiences circuit module by extending and improving it. The breadboard version module can be built even by inexperience user and thus saves money and time.

6.2 Limitations of using arduino

1. Structure

As we know that arduino comes in handy structure, it is not applicable in large scale. For a large field it is very difficult to use arduino as it can only handle limited number of sensors which includes temperature, humidity, ph scale and some of the devices linked to it like raspberry pi and GPS module.

2. Cost while purchasing

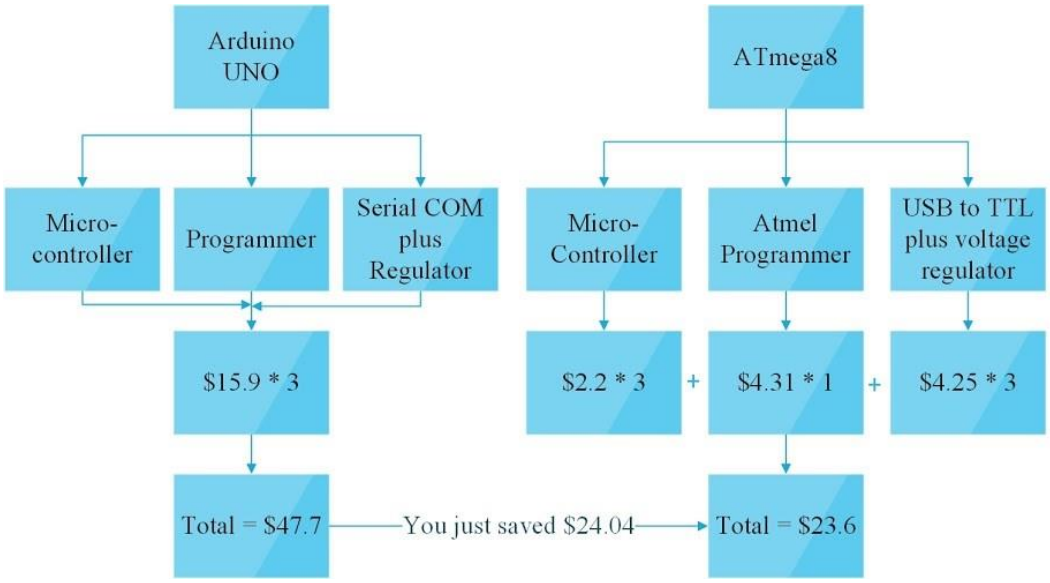

Fig.21 comparison of cost

As clearly mentioned from above fig.21 using arduino can cost upto total of $47.7 which comes upto 3332.32(assuming 1$=69.86) and on the other side ATmega8 can cost upto $23.6 which is equivalent to 1649 so we can say that arduino's price comes double than the ATmega8 but knowing the version which we are using which is (arduino uno R3) it cost around Rs 500 and more benefit to other devices which act like one.

Chapter -7

CONCLUSION

7.1 Conclusion

Since IoT farming application are making it workable for farmer to gather important information leading to improvement in the quality of their crop. Many land owners must comprehend the capability of Iot usage for farming by introducing smart innovation to increase output. The need for increasing population can be fulfilled if the user can use IoT technology in a successful manner.

In this report, the answer for analyzing smart agriculture has been exhibited. This system can go about as an early alert structure for best in class risk, a watching system continually giving a record of the farms. It ensures that using IoT can not only improve adequate specialized learning programming skill and equipment segment but also renders its practical usage for society. This scenarios are prolong by an overview of officially existing head ways including framework traditions open source software and pitiful hardware portions which are used for the execution purposes through an establishment consider on the business prediction of such system, a method which uses the arrangement of the activity gives structure to prescribe motivating forces.

7.2 Future Scope

The future goal for IoT leads in smarter cities. IoT technologies help to improve the quality of life and change cities to better and smarter world.

Fig...22 Future scope of IoT

Future scope for this project is with the concept of IoT as shown in Fig. 22, all the datas gathered can be brought to cloud so that more datas can be fetched and can be stored.

Given below are some of the main future scopes of IoT:

1. **Smart agri-logistic**

It is all about smart fooding and agri-business. It focuses on servicing fresh product quality and natural production process with flexible chain- and compassing tracking and tracing system.

2. **Smart Food Awareness**

It deals with customer profile, health and awareness and normal days in the future super market. The demand for healthier but enjoyable diet is increasing, so we need to consider and serve it.

Therefore we have to develop a system using iot which will aim for creating awareness in food quality

3. Smart Farming

Using data mining and big data analysis, we can collect data for different parameter helping us to answer which crops are better suited for this particular places and which season. Using sensors and device on the livestock can maintain the health which directly benefit farmers.

7.3 Application of IoT in farming

Using IoT concept in agriculture field will help farmers not only reduce waste but also increase in yield production varying from the quantity of fertilizer utilized to the quality of the production achieved.

These days IoT has also been implemented in these following practices.

1. Crop Monitoring

Using IoT technique we can monitor the quality of crop which thus increase the food production. It introduces the use of appropriate method into agriculture sector and better crop production by collecting real-time quality of crop and informing farmers about their crop growing status.

2. Precision Farming

Precision farming is a farming practice that are more accurate and controlled. It deals with production of crop along with raising livestock. In this farming techniques, we use component such as SN, system control, robots, autonomous vehicles, automated hardware. Such as crop metrics

3. Green Agriculture

This technique uses control mechanis4.m technique for environment parameters.

To control environmental factors for a smart greenhouse, we use different sensors that contribute to environment parameters such as soil quality and soil type .

4. Livestock Monitoring

With the help of sensor , health of the livestock can be monitored which will directly help in the yield production of good produced from them**.**

5. Agricultural drones

Is a good example for farming and inorder to improve the various agricultural practices, drones are used.

Some of the most drone companies deal with the performance in

1. Crop counting
2. Potential of the yield /Quality

3Detection in leakage

4. Pest detection

Benefit for using this type of practices is it gives ‘high “resolution of data

Easy information if any leakage takes place in form of notification.

Get accurate count for crop so that it helps in setting plan schedule for your next growth and future yield .

Example of app using agricultural dones-

Kaa is a built application introduced to come up the solution for smart farming.it is built on modular architecture for microservice allowing needed updates changes,integration and extension.

to steadily expand their IoT device ecosystems and implement new smart farming solutions over time. Managing and upgrading your multiple solutions on a single IoT platform ensures lean operation and predictable outcomes, not the least because your own expertise adds up in a coherent manner. Out of the box, Kaa already provides a set of ready-to-use components for a quick start with smart farming applications and we made sure that you could implement any type of modern agriculture use case with Kaa.

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