IOT based Green Agriculture and Analysis System

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

in

Information Technology

By

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Under the supervision of

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to

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We would like to thank all our colleagues, who have given us moral support and their relentless advice throughout the completion of this work.

Finally, we would like to thank god for not letting us down at the time of crisis and showing us the silver lining in the dark clouds.

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Abstract

Farming drama an important developmental of the agri-countries. Around 80% the inhabitants depends the unindustrialized and approximately 1/3 of the countrywide assets came for the agriculture. in India. problems regarding the farming has always hampering of countries. Possible solution of problem is that agriculture latest trends must be modernized by the agriculture. Therefore, agriculture to make the agriculture smart with the help of IoTand automatio technologies. The presenting feature of this project comprises of with depend upon data that is real time that comprises of pH, temperature, moistureof soil and humidity of the soil. Regulation of each and every operation would be through the computer which is to the network the operations would be doneby incorporating the sensors and Intel Galileo Gen 2.

1. INTRODUCTION

IoT(Internet of Things) is a view that was came into existence in 2009. This view encompasses the idea of connecting all gadgets and devices to the internet. The concept of Internet of Things is actually trying to change our world. It is augmenting our health, life as a whole, and businesses, society by developing products which would prove to be comfortable in our life. This is projected that by around 2020, about 50 billion equipments would be linked to the internet and the market would be worth around14 trillion USD.

The Internet of Things is an emergingname of economic, social, technical implication. Sensors,cars and trucks,industrial and utility components, durable goods, Consumer products, and united because of us renovate play, work.Estimates for the crucial influence on the economy and Internet are remarkable, along with some around 100 billion connected IoT and a universal influence of around 11 USD by 2025.

Second Green Revolution-

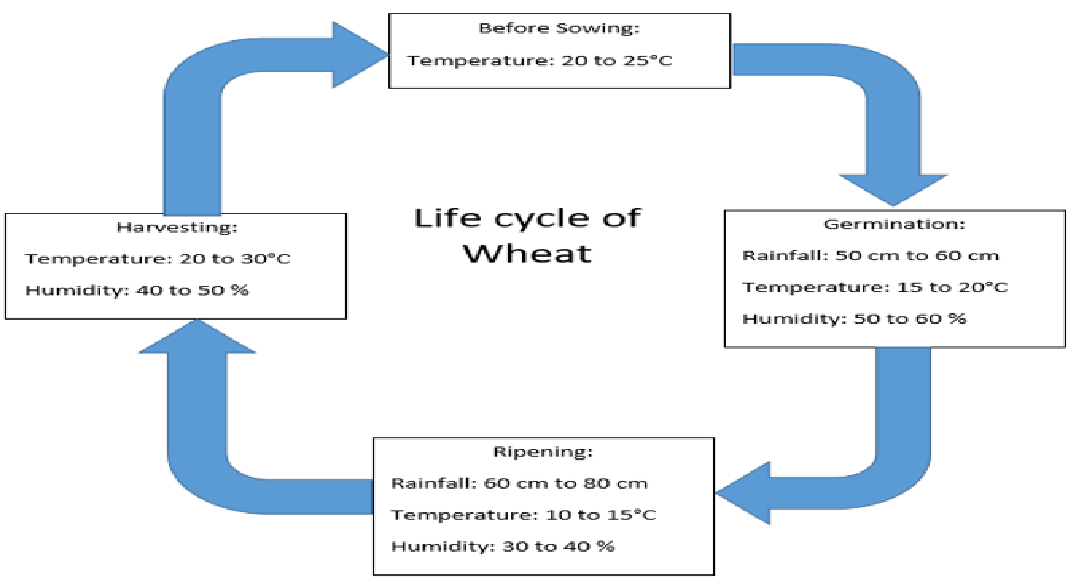
Postwar revolution of agriculture rescuedaround billion people from undernourishment. Nowadays, a second revolution, basedmainlyon technologies that encompass the Internet of Things, makes assurances to mark the farm of the future moreefficient andproductive.

Now the Technologies likemonitoring equipmentand advanced sensors canlet farmers to screen crops more accurately and continuously than those in the past.

1.1 Deep study

Present day world is in an advancement arrange wherever hurts concerning worldwide issues like a dangerous atmospheric deviation and option vitality sources are imparted to new difficulties. It requests quick arrangements. Center of society has moved from financial development to practical development. In this maintainable improvement ecological, social, and monetary viewpoints are cautious together, instead of independently. Arrangements that advance maintainability in all divisions of the economy (assembling, agribusiness, and administrations) are presently considered as a piece of good administration. Issues, for example, environmental change, populace development, and destitution (particularly hunger), happen in a setting of a slow exhaustion of common assets and the dread of reducing coal vitality saves. These are a portion of the worldwide so as tended to effectively. General venture we concentrate on farming creation & development. The general procedure has a critical part in satisfying the fundamental human requirement for nourishment. The generation, arrangement, bundling, circulation, and so forth of nourishment additionally produces a considerable measure of salary.

Farmer must know the following lifecycle



The point of this venture is to endeavor current advancements and apparatuses to enhance checking and administration of yields, so as to enhance the proficiency and manageability of cultivating and nourishment generation. To this end, we have outlined a framework for accuracy agribusiness, which depends on a remote system joined with a support of furnish individual agriculturists to information helpful. framework uses hubs gather information about of the, dirt, and different option in a farming. The objective is to give a rancher a more entire photo of the present and notable yield status to cultivate better educated basic leadership. It is normal that such choices will profit both cultivating and water system by sparing time and assets. Elements, for example, the assorted qualities of conditions which fluctuate contingent upon area (for instance climate, nearness of creepy crawlies, and infection) consolidated with the failure to foresee the future attributes of the earth amid the distinctive seasons after some time muddle the basic leadership handle and require specific information. This venture is an endeavor to bring some of these miniaturized scale ecological wellsprings of data into the basic leadership procedure of ranchers.

1.2 Problem definition

The process of utilizing technology in farming and cultivation requires deep knowledge of agricultural processes, biology, chemistry, and empirical knowledge. There are many parameters which must be taken into consideration and investigated in depth when designing a system that should improve cultivation procedures by making the whole process more effective and sustainable. In order to design and build a precision agriculture system that can be widely used by many users and applied in different contexts, many questions need to be addressed. Some of these questions are:

- Is it feasible to design a system that will accommodate every possible scenario in an agricultural context and do so for all possible users?
- Is automation in agriculture really useful and in what part or parts of the cultivation process (e.g. seed planting, growing, harvesting, selling) can it be applied?

Agricultural science is a multidisciplinary field and all of the above aspects need to be taken into account when making decisions about cultivation of a field on a farm. Furthermore, research in agricultural science is strongly related to local areas. Climate and soil properties vary from one place to another and from time to time. Climate change and transformation of the plants and soil occur as time passes, thus making successful and sustainable cultivation a tough process for someone who does not know the specific aspects of the locality and how the process needs to evolve over time in this specific geographical and microclimatic area.

2.LITERATURE SURVEY

2.1) Title-"IoT based Smart Agriculture"(June, 2016)

In the development of agricultural country, agriculture plays dynamic role. 80% population is dependent around 1/3 of the capital is being fulfilled byfarming. which always of the country Solution is farming which is trying to modernize the contemporarycustomaryapproaches of agriculture. Thus, this projectis aimingtowards making IoT technologies automation. accentuating comprises of which performs tasks likevigilance,keeping,animal scaring weeding, bird,spraying andmoisture sensingetc. Furthermore, it comprisesof smart irrigation along with intelligent decision making and smart control based upon precise real time field datasets. smart store room comprises of theft detection, humidity maintenance andtemperature maintenance in the warehouse. Monitoring each and every one of would interfacing raspberry pi, or actuatorsand along withZigBee modules, Wi-Fi sensors.

2.1.1) Introduction

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the papers signifies the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The collected data provides the information about different environmental factors which in turns helps to monitor the system. Monitoring environmental factors is not enough and complete solution to improve the yield of the crops. There are number of other factors that affect the productivity to great extent. These factors include attack of insects and pests which can be controlled by spraying the crop with proper insecticide and pesticides. Secondly, attack of wild animals and birds when the crop grows up. There is also possibility of thefts when crop is at the stage of harvesting. Even after harvesting, farmers also face problems in storage of harvested crop. So, in order to provide solutions to all such problems, it is necessary to develop integrated system which will take care of all factors affecting the productivity in every stages like; cultivation, harvesting and post harvesting storage. This paper therefore proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The paper aims at making agriculture smart using

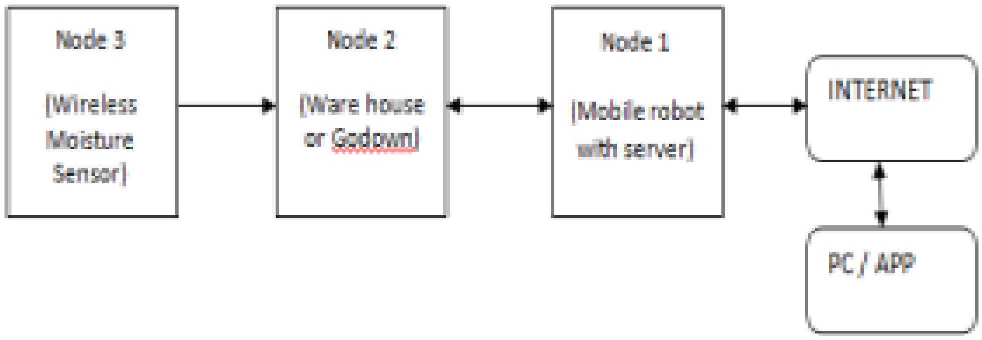
proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The paper aims at making agriculture smart using
automation and IoT technologies. The highlighting features of this paper includes smart GPS based remote controlled robot to perform tasks like; weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, etc. Secondly, it includes smart irrigation with smart control based on real time field data. Thirdly, smart warehouse management which includes; temperature maintenance, humidity maintenance and theft detection in the

2.1.2) Why Smart Farming?

The newer scenario of decreasing water tables, drying up of rivers and tanks, unpredictable environment present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture sensor at suitable locations for monitoring of crops is implemented in. An algorithm developed with threshold values of temperature and soil moisture can be programmed into a microcontroller-based gateway to control water quantity. The system can be powered by photovoltaic panels and can have a duplex communication link based on a cellular. Internet interface that allows data inspection and irrigation scheduling to be programmed through a web page.

The technological development in Wireless Sensor Networks made it possible to use in monitoring and control of greenhouse parameter in precision agriculture. After the research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts. Some of the research attempts are done for betterment of farmers which provides the systems that use technologies helpful for increasing the agricultural yield. A remote sensing and control irrigation system using distributed wireless sensor network aiming for variable rate irrigation, real time in field sensing, controlling of a site specific precision linear move irrigation system to maximize the productivity with minimal use of water was developed by Y. Kim.. The system described details about the design and instrumentation of variable rate irrigation, wireless sensor network and real time in field sensing and control by using appropriate software. The whole

2.1.3) System Overview

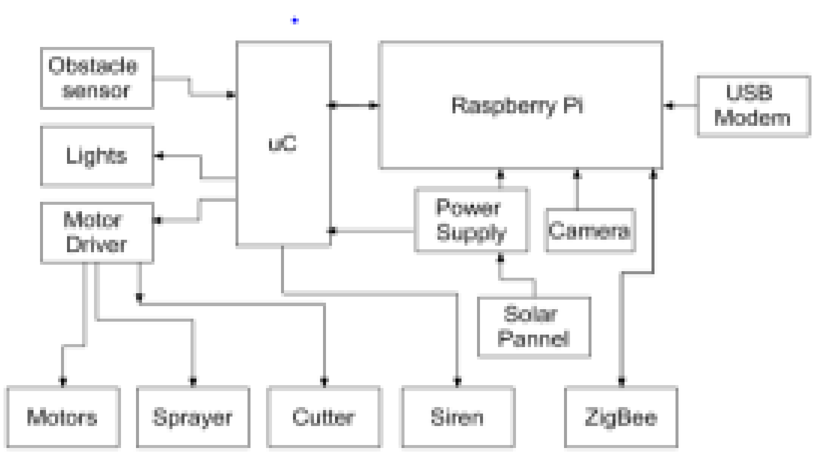


This paper is composed of 4 parts-Node1, Node2, Node3 and PC for controlling the required system. Each node is combined with several sensors and policy. They are organized systematically in one main server through wireless communication modules.

Then this main server sends and receives knowledge from customer end by means of internet. Auto mode and manual mode are the most general modes of operation.

2.1.4) System's architecture

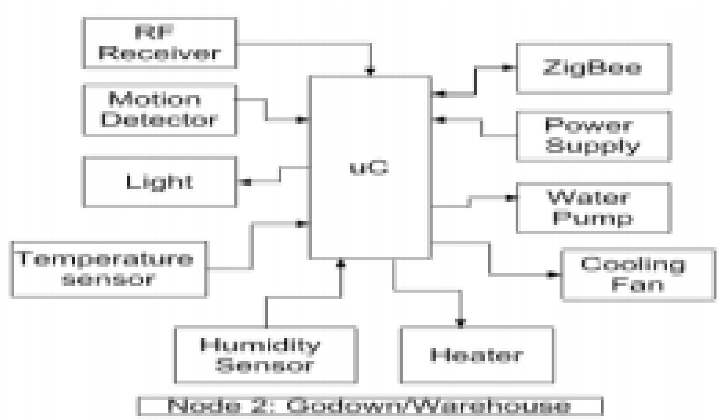
Node 1:



Node 1 : Mobile Robot

It is a robot that is restricted tenuously with PC.It is also planned for navigating independently surrounded by the edge of. The Remote controlled robot has various sensors and devices .

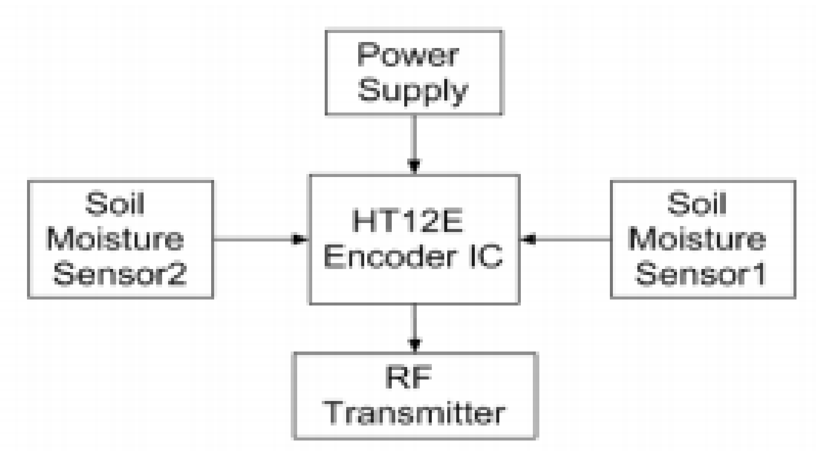
Node 2:



It is the warehouse which is made up of motion detector, light sensor, humidity sensor, temperature sensor, room heater, cooling fan altogether interfaced with AVR microcontroller. Functions of Node 2 are:

Motion detector detects the movement whilst security manner is ON .On discovery of movement it sends aware indicator to user through Raspberry pi .Thereby providing theft detection.

Node 3:



It has characteristics such as Smart control of water pump .
Humidity This data is received by node2 where for controlling the operation of water drain.

2.1.5) Hardware and Software used:

Equipment required in this project:

a) AVR Microcontroller Atmega: This venture does consumption.

b) ZigBee: is consumed finishing remote association in the midst of Series for is just concerning which is prolonged consuming high power modules.It starts operating on 2.4 gigahertz reappearance. Energy utilization is very low It becomes more affordable when contrasted with dissimilar remote modules. It is generally used to build up remote neighborhood.

c) Temperature: Yield of LM35 is purposely matching to temperature.. It is least effort sensor which is now having low yield impedance and direct yield. The operational temperature run With mount in temperature, the acquiesce electrical energy of the sensor increments straightly and the approximation of electrical energy is provided to the microcontroller which is then duplicated by the change analyze request to provide the approximation of required temperature.

d) Moisture sensor: Humidity and amount of moisture present in soil is measured by this sensor which brings out of dirt. The affiliation among the deliberate property and soil dampness is familiar and it might shift dependent on natural elements like temperature, soil sort, or electric conductivity. It exchanges it keeping in mind the end goal of making control move of exchanging.A fundamental, negligible attempt mechanized temperature sensor. It has a capacitive sensor for measuring dampness.

e) Raspberry Pi : The Raspberry Pi is little pocket measure PC used in small enlisting and frameworks organization operations. It is the key segment in the field of web of things. It offers access to the web .It does so now on the relationship of computerization system with remote territory controlling device

f) AVR Studio Version 4: It is utilized to compose, fabricate, aggregate and troubleshoot the inserted c program codes . This product specifically gives a hex document which can be effectively singed into the microcontroller.

g) Proteus 8 Simulator: Proteus 8 is the best accessible programming for circuit outlines microcontroller. It has each microcontrollers and electronic parts promptly accessible in it .

h) Dip Trace: Dip race is EDA/CAD programming for making schematic graphs and printed circuit sheets.

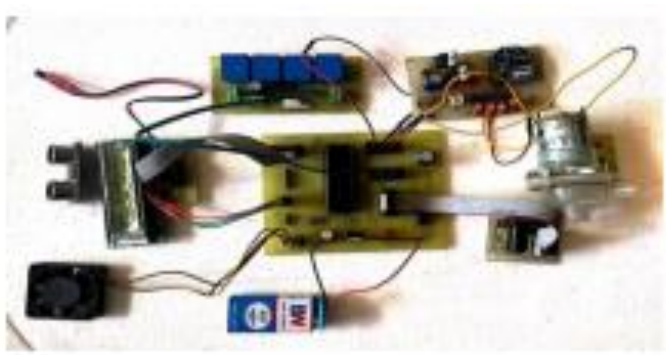
d) SinaProg: SinaProg is a Hex downloader application with AVR Dude and Fuse Bit Calculator. This is utilized to download code/program and to set wire bits of all AVR based microcontrollers.

e) Raspbian Operating System: Raspbian working framework is the free and open source working framework .It gives the essential arrangement of projects and utilities for working Raspberry Pi

2.1.6) Experimentation and Results

As shown in the above figure, experimental setup for node1 consists of mobile robot with central server, GPS module, camera and other sensors. All sensors are successfully interfaced with microcontroller and the microcontroller is interfaced with the raspberry pi. GPS and camera are also connected to raspberry pi. Test results shows that the robot can be controlled remotely using wireless transmission of PC commands to R-Pi. R-Pi forwards the commands to microcontroller and microcontroller gives signals to motor driver in order to drive the Robot. GPS module provides the co-ordinates for the location of the robot.

As shown in the above, node2 consists of motion detector, temperature sensor, humidity senor, cooling fan, water pump, etc. connected to the microcontroller board. The sensors give input to the controller and according to that microcontroller controls the devices in auto mode and also sends the value of sensors to R-Pi and R-Pi forwards it to user's smart device using internet. Test results shows that when temperature level increases above preset threshold



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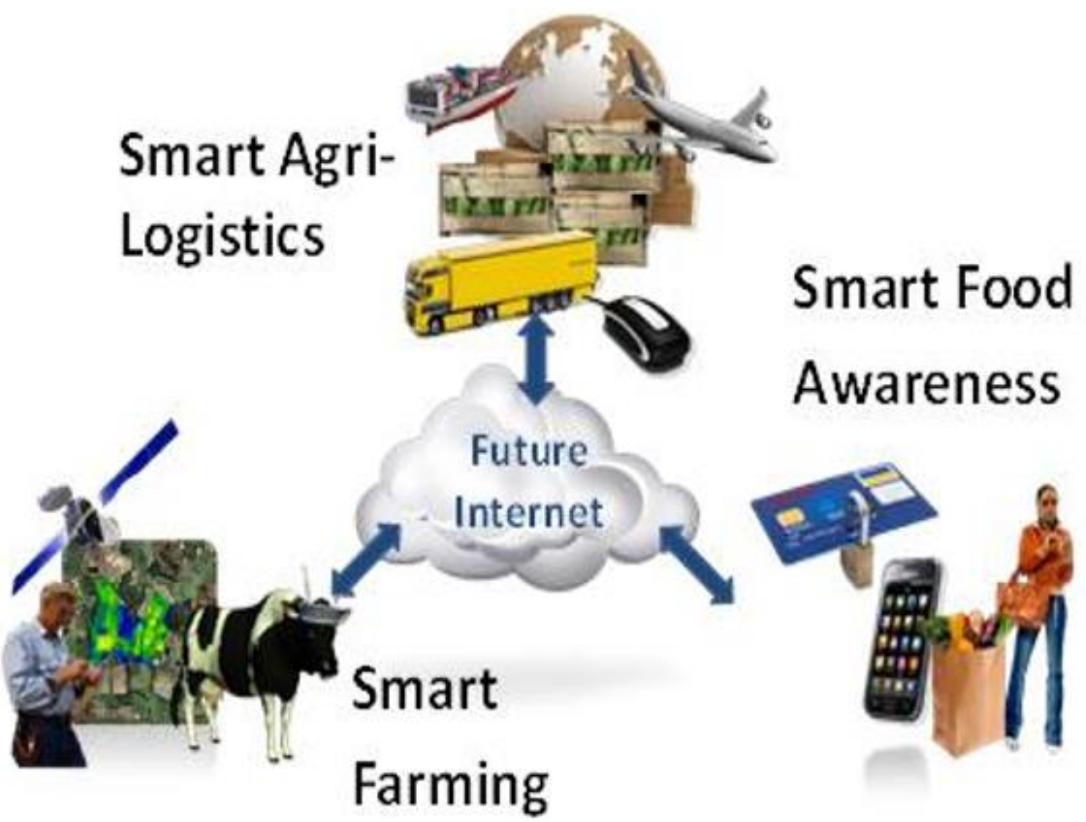
2.1.7) Conclusion

The sensors and microcontrollers of all three Nodes are successfully interfaced with raspberry pi and wireless communication is achieved between various Nodes. All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and storage problems using remote controlled robot, smart irrigation system and a smart warehouse management system respectively. Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

2.2) Title- "Smart Farming, WP 200" (2011)

SmartAgriFood's goal is helping in agri-nourishment partition. This does so by anticipating and relating it to specialized, execution and non-performance Future Internet determinations in brilliant agri-sustenance creation for shrewd cultivating. Identifying and creating brilliant agri-sustenance particular capacities and calculated models. Identifying and showing existence of experimentation structures and begin client group building. Thereby bringing about a usage get ready for the following stage in the system of the FI PPP program.



2.2.1) Introduction

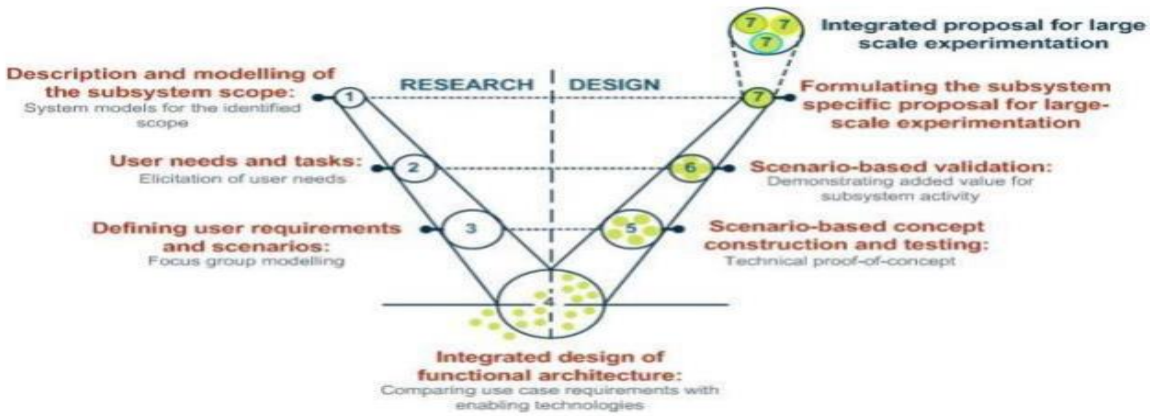
The assigned project is concerned with the delivery of thorough examination of the theoretical proposed “Smart Greenhouse” “Smart Spraying. evaluation is done discretely designed for Smart Spraying and the Smart Greenhousepilot.Observtion of final end customer examination are written in detail in this document. The customers who all will be using this project will see advantages and their life can become easier by accepting such kind of scheme. This is done so by incrementing success of job and drop of workload. The Smart Greenhouse pilot is purposely evaluated in Greece. Many number of respondents regard the pilot as useful. Various functionalities are recommended. For evaluating taken as a whole result of the Smart Farming sub use cases. Business case was analyzed seriously for the economic benefit of this future planning project. Advantages of such schemes are slight reduce in costs, moderate increase in earnings Taking surroundings and nature into botherationSmart Farming can benefited by civilizing irrigation application and lower energy consumption.

2.2.2) Goals

The main purpose of this project is to develop a small scale prototype pilot system . Conceptual prototypes are used for these. Realizing and their in general appraisal, case linked functionalities with end-users and documented.. The end user validation is done in the Smart Spraying and the Smart Greenhouse pilot. . The Smart Greenhouse pilot is evaluated in Greece. A number of additional functionalities are suggested.

2.2.3) Validation Results

Smart Spraying and Smart Greenhouse. The project defines seven steps via which is described in the following figure.



2.2.4) Intermediate Evaluation results of Smart Spraying

<u>Step 1:</u>

utilization outline assessment in proposed showering idea setting whole evolved way of life. A model was produced that exhibits how the performers of all the concentrated three evolved way of life procedures. It must consider the worldwide natural pecking order challenges. The thinking of the global difficulties winds up noticeably clear in the choices.

Qualities are:

- Avoiding crop and damages
- Producing more products
- Decreasing the crop effortlessly
- Requirement immediately
- Linking stakeholders
- Connection authorities

<u>Step 2: End-user needs</u>

Combination of user needs on

- Sufficient information collected into a connected database.

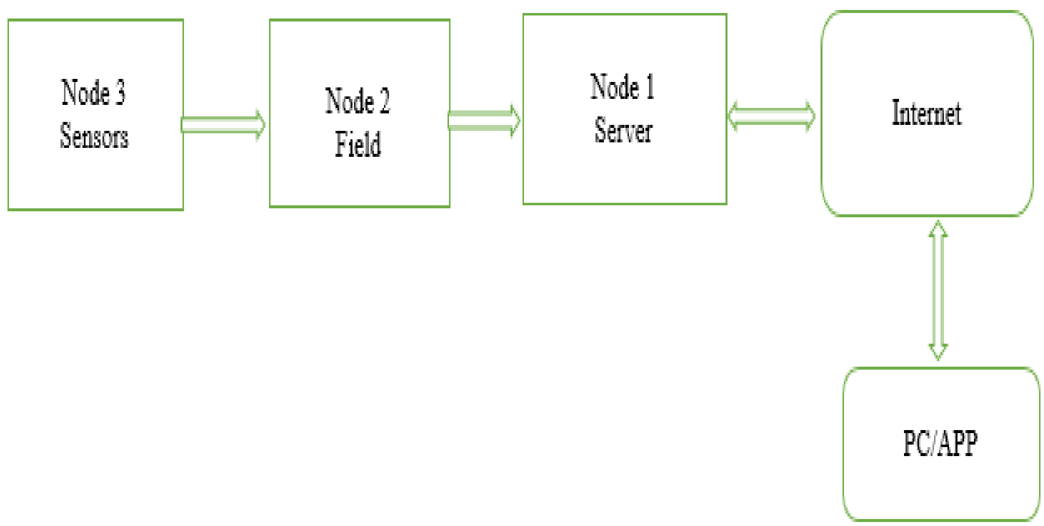
- Sensor information could be useful.
- Using a network of sensors.
- In many regions there is not complete .

2.2.5) Conclusion

The created Smart cultivating a show (cultivating administration showering) and nursery, beginning showings for UIs, have increased positive reactions included with the plan improvement confront. advancement cultivating idea-client association ought to be proceeded and grown further

3.) SYSTEM DEVELOPMENT

3.1) System Overview



Node1: Sensors

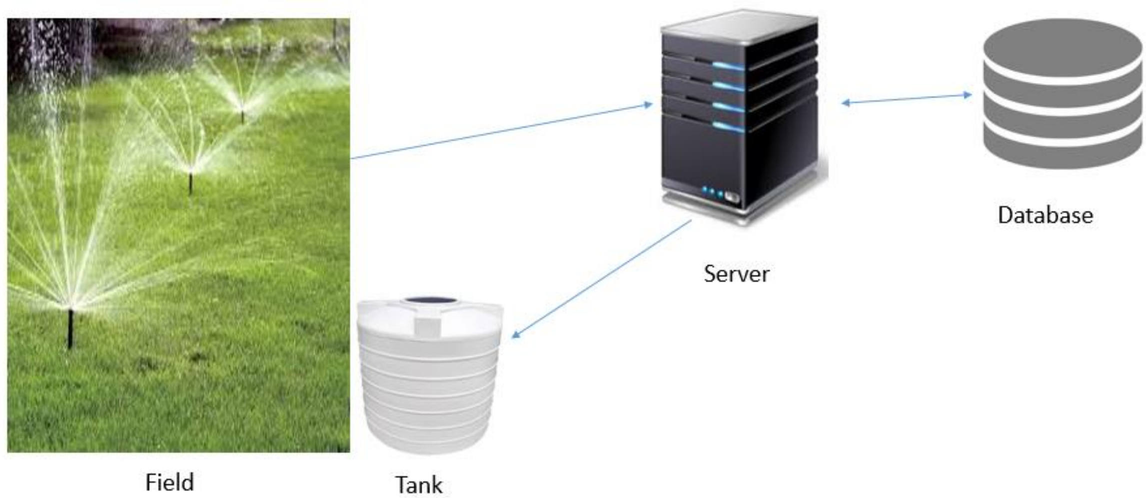
Node 2: Field

Node 3: Server

Node 4: Internet

Node 5: PC

3.2) System Architecture



<u>Node 1:</u>

Node 1 is a server component which deals with receiving collected data from sensors deployed in the field and sending it to the database. Server interacts with requests and server respond it with response to accept data through cloud.

<u>Node 2:</u>

Node 2 consists of field where sensors deployed and we get the data where
All the tests are done.

Node 3:

temperature sensor, humidity sensor, phsensor, Soil moisture sensor. Are present in node 3 which provides essential data by sensing according to various conditions.

Internet:

Node is mixed with many sensors and equipments they communicate with each other and share data using Ethernet.

PC/APP:

Website is developed to display the data from the database connected to the server and also receiving live data. There is also a Login system for the users to who wish to see the data and all the related information like crop suggestion system.

3.3) Hardware and Software used

Hardware Requirements:

- Intel Galileo Gen 2
- Humidity sensor
- Temperature sensor
- Moisture sensor

Software Requirements:

- Arduino SDK
- Xampp Server
- Brackets
- Php

System Required:

- CPU: 2.1 GHz Processor and above
- RAM: 2 GB or above
- OS: Windows 7 or above

Hardware Used:

Intel Galileo Gen 2 Development Board:
Intel® Galileo Gen 2 board is a very powerful board which is based upon the Intel® Quark **™** X1000 application processor. It is considered to be a development board based on Intel® architecture designed to be software pin-compatible hardware along with shields designed for the Arduino.

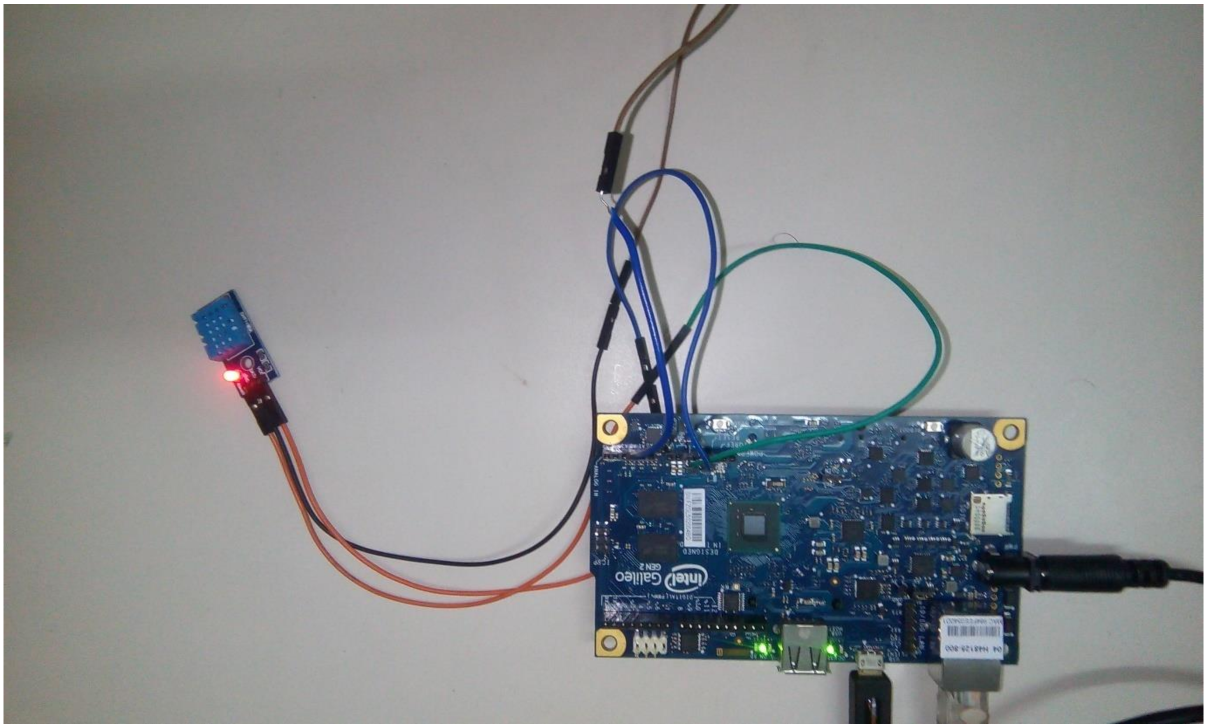
The platform gives us support on Linux*,Microsoft Windows*. It also carries the development through the IDE.

Intel® Galileo Gen2 Front

Intel® Galileo Gen2 Back

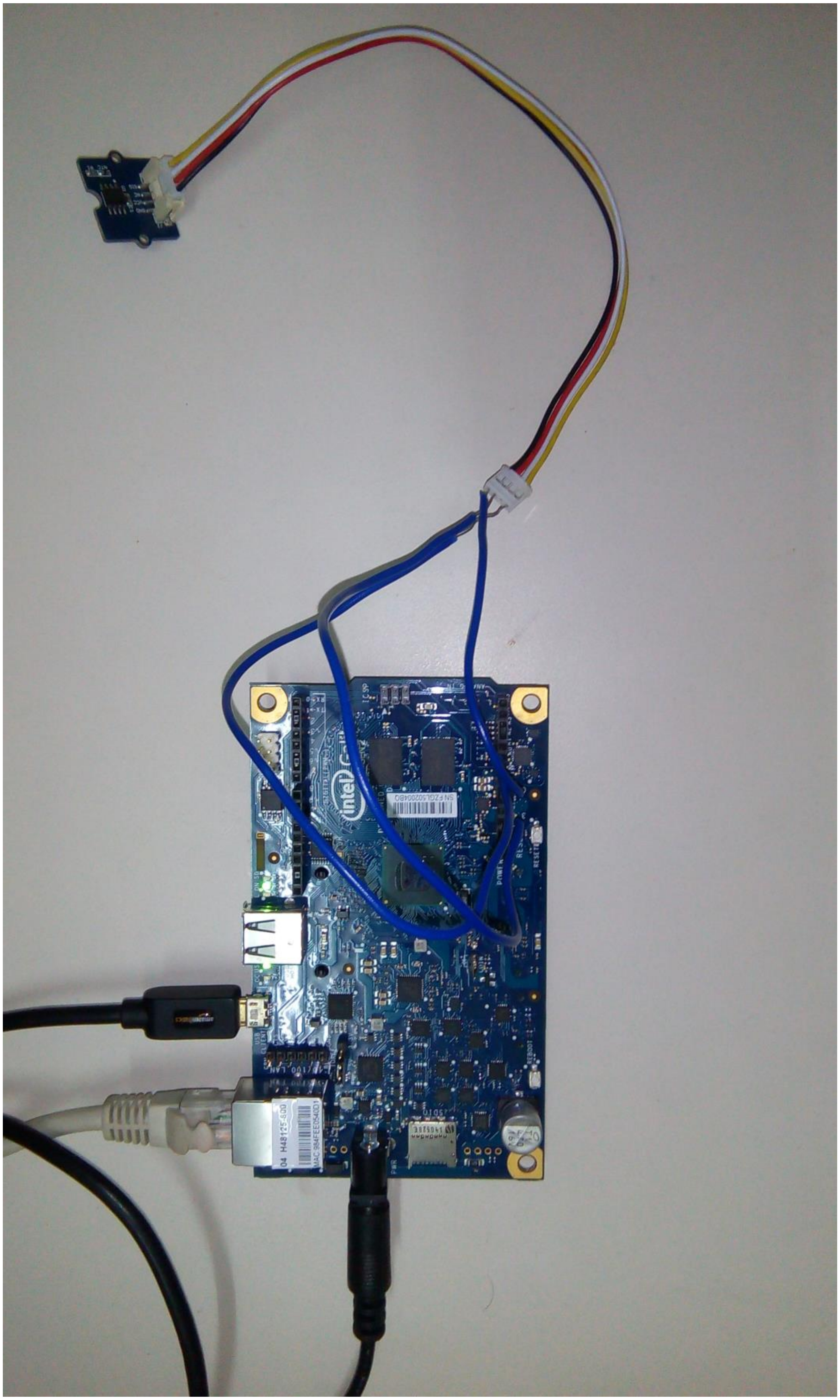
Humidity sensor:

A basic, low-cost humidity sensor is used. It gives out digital value and hence there is no need to use conversion algorithm at ADC of the microcontroller 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.



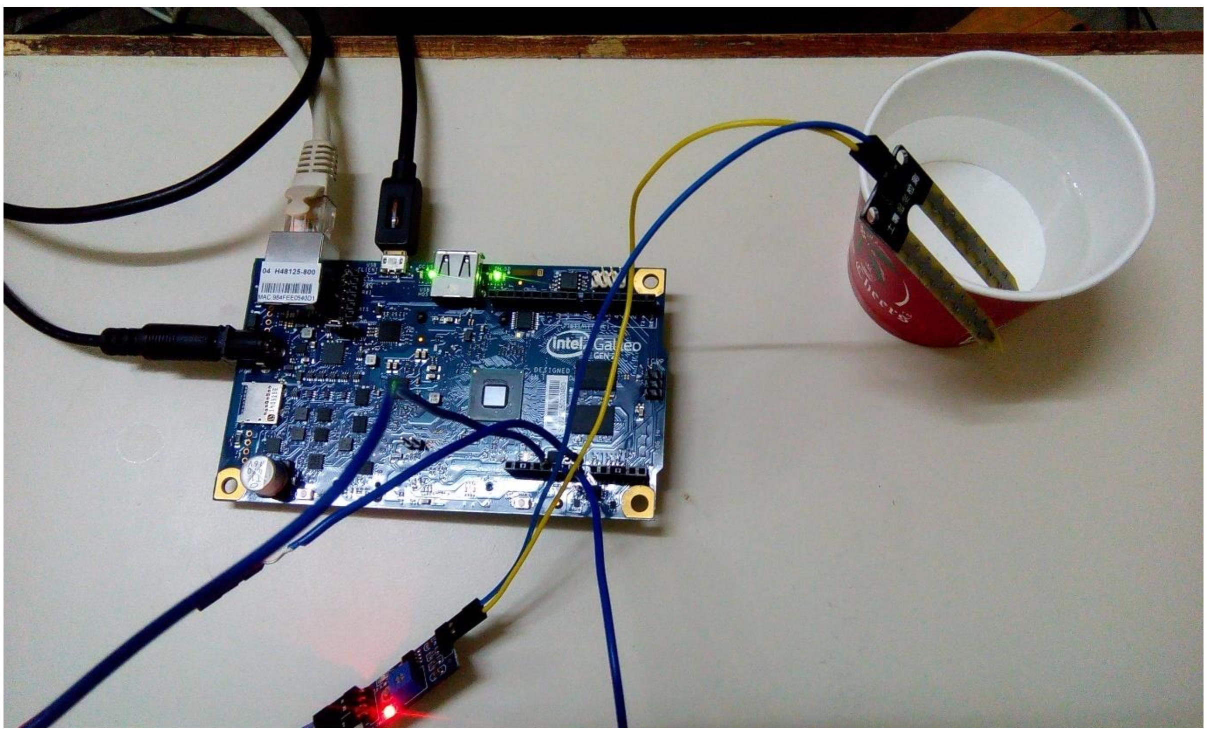
Temperature Sensor:

A low cost sensor is used. It has low output impedance and linear output. The operating temperature range for LM35 is −55˚ 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.



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 may vary 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 microcontroller in order to take controlling action of switching water pump ON/OFF.



3.4) Model Development (Experimental)

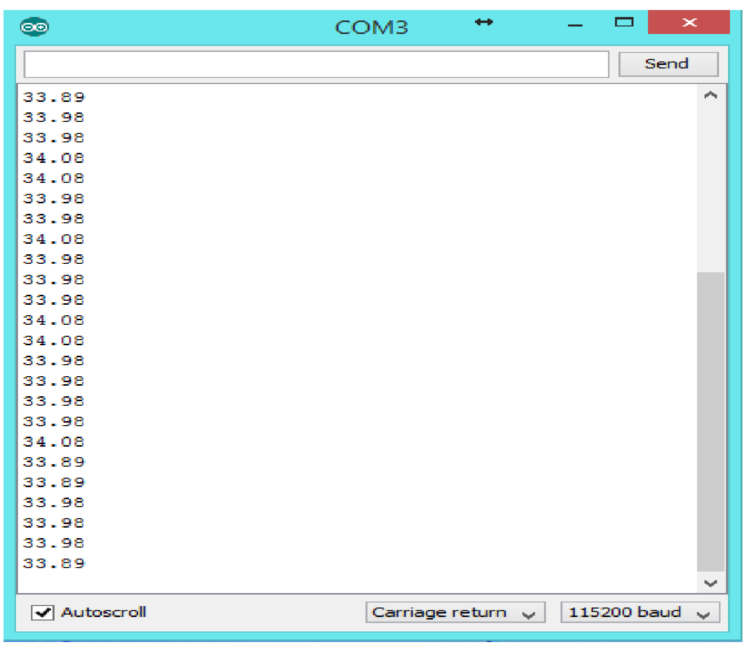
Temperature Sensor

1. Intel Galileo Gen 2 board
2. Grove - Temperature sensor
3. Grove - LCD RGB backlight display

Assembly:

1. Connect the Grove - Temperature Sensor to the A0 port on the Base Shield
2. Connect the Grove - LCD RGB backlight to the 12C port on the Base Shield
3. Connect the Galileo Board to the a power supply of about 7 - 15V
4. Upload the given code on your Arduino IDE

Temperature Reading:



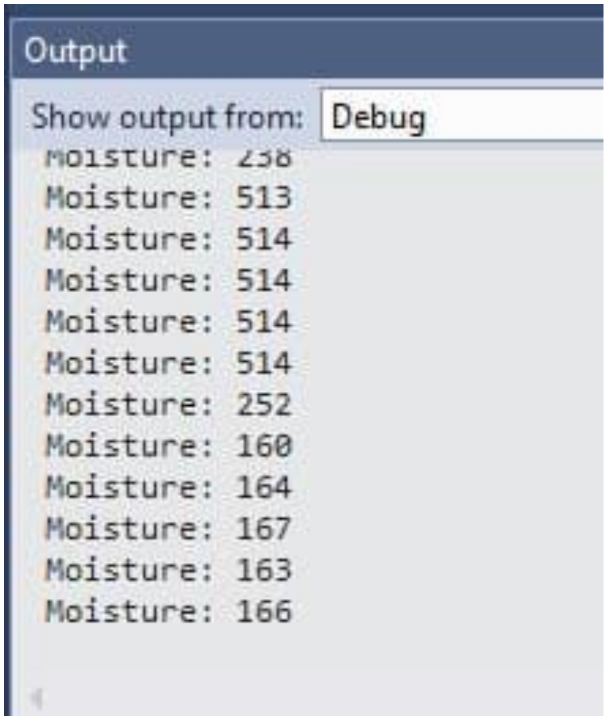
Moisture Sensor:

- Moisture sensor
- Intel Galileo Board Gen2
- Jumper
- Board
- Light Emitting Diode

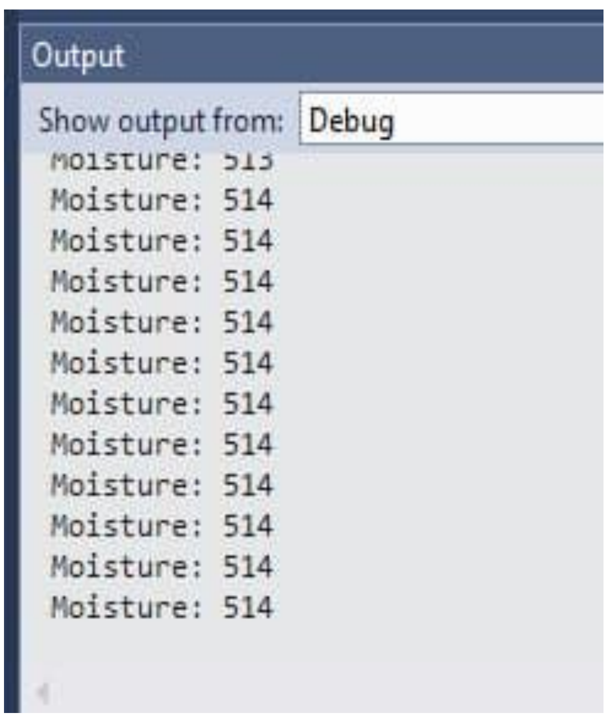
Interface

- Power : 5v
- Pin Diagram:
- AO:(Yellow wire)
- Ground(Black wire)
- Power Supply (Red wire)
- DO: Digital

Sensor placed in water:

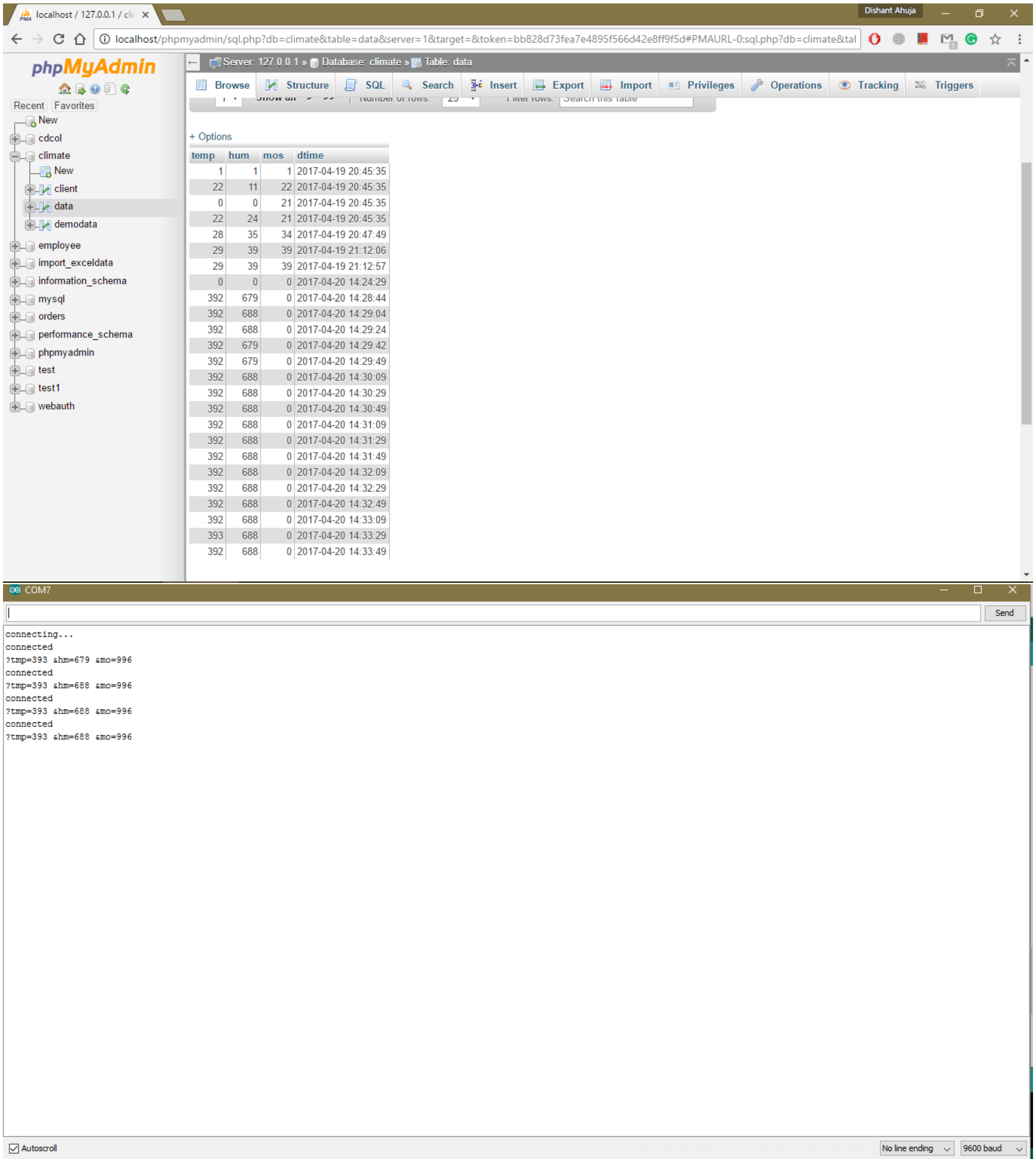


Reading when the sensor is placed in Dry air

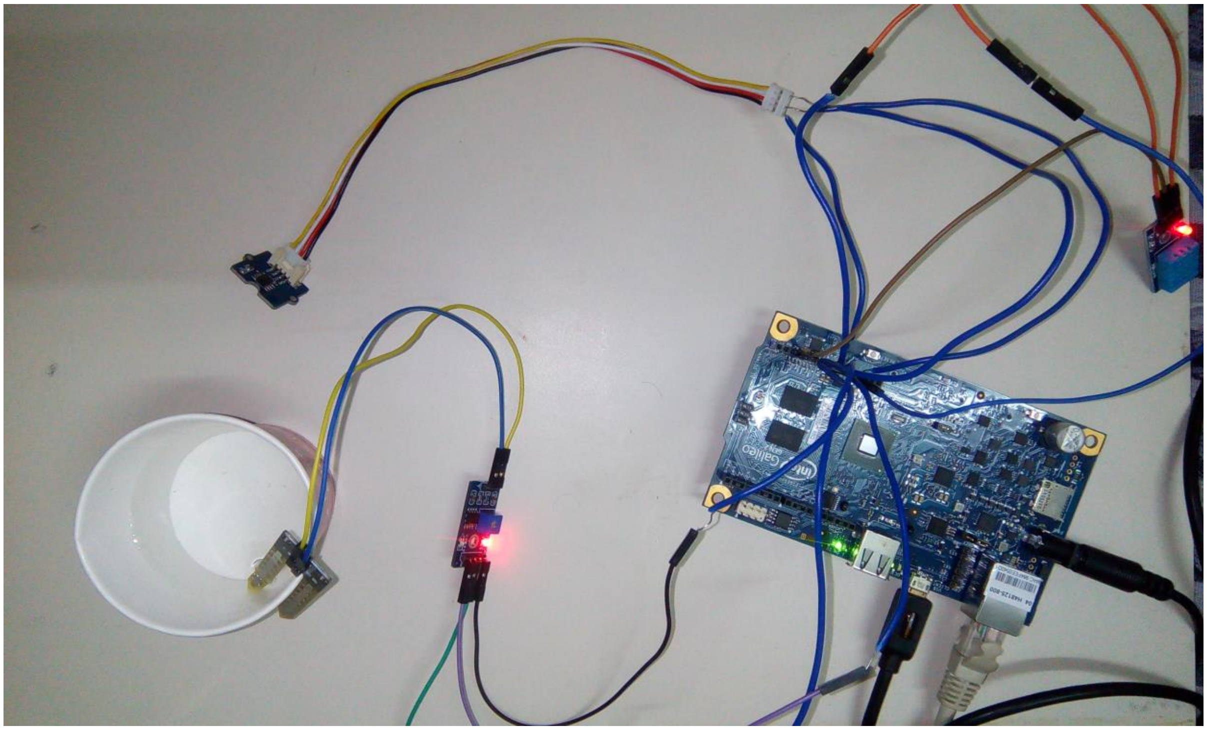


Experiments and results(Screenshots):

Sensor Readings in the database:

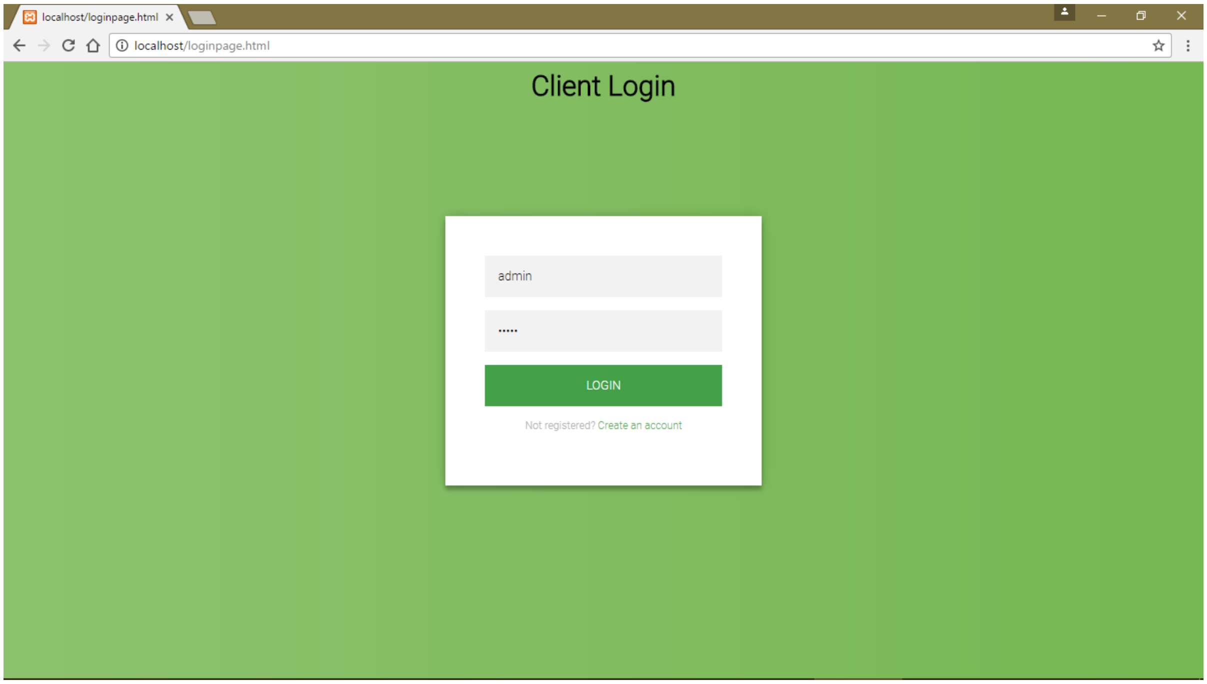


Sensors connected for data sharing and graph plotting:

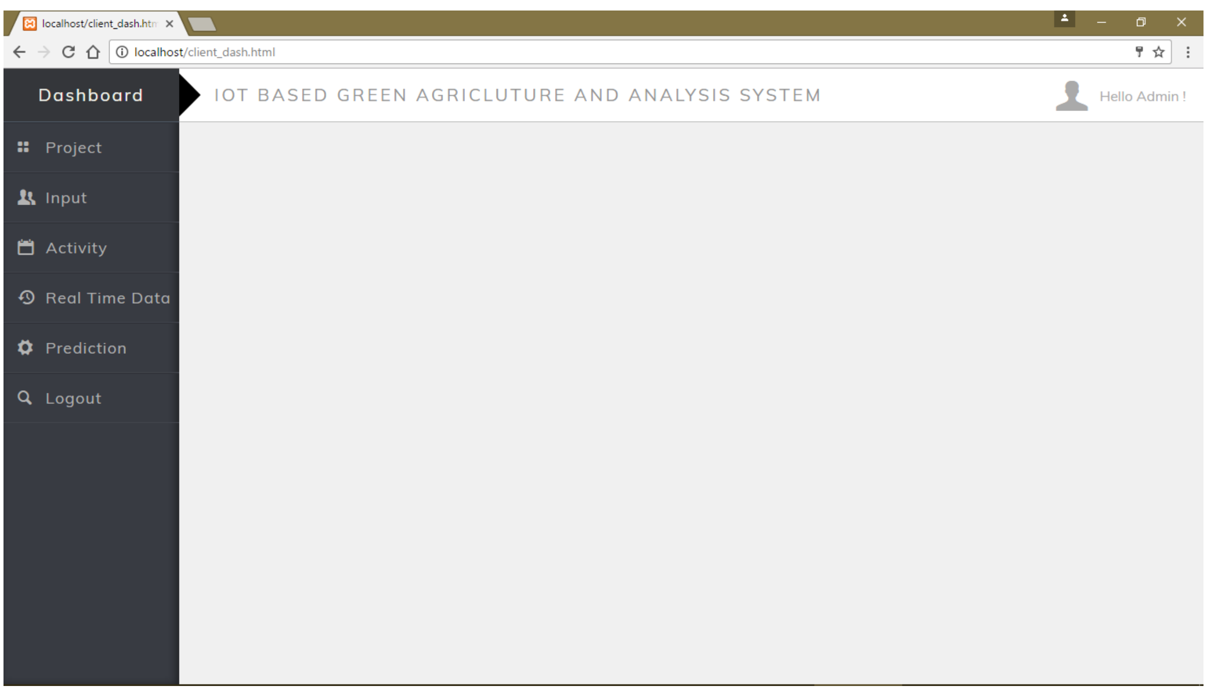


Functionalities Added (Screenshots):

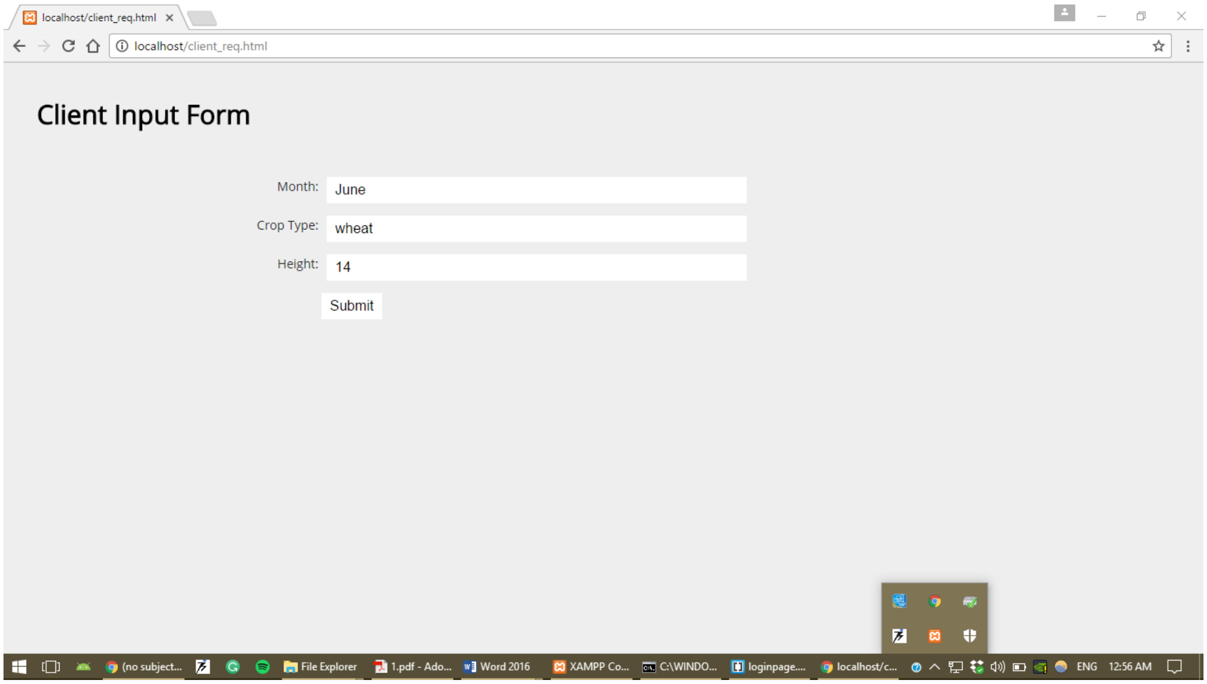
Client Login Page



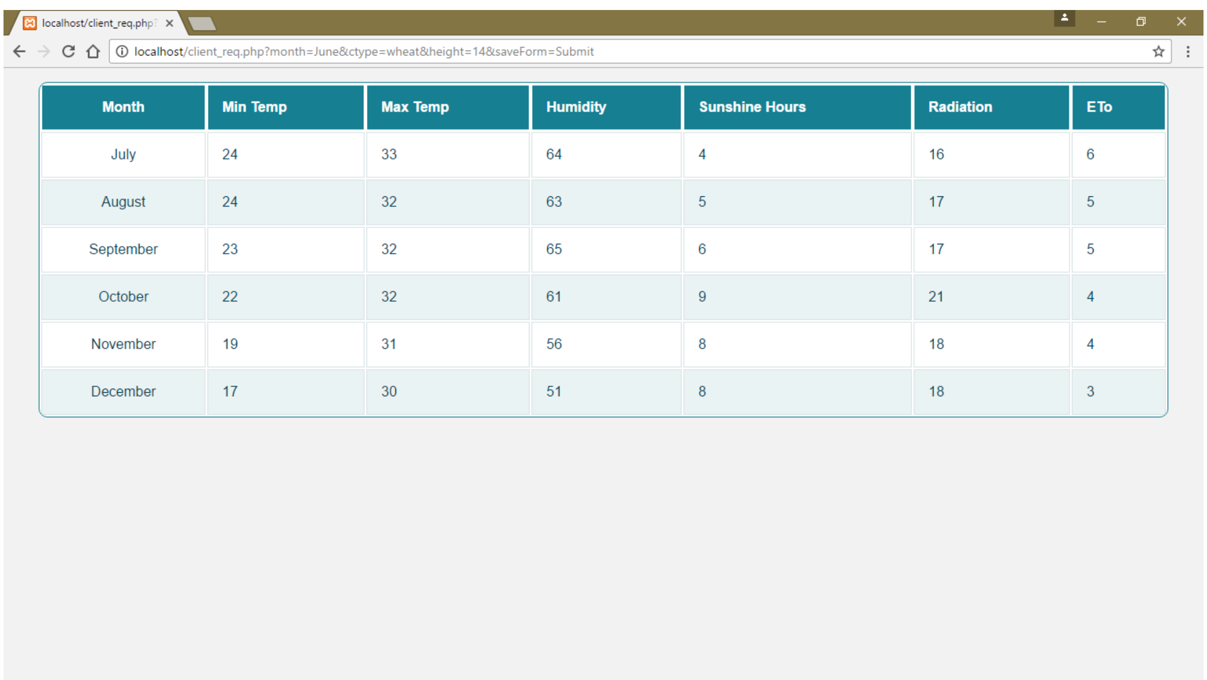
Client Dashboard



Client Input form

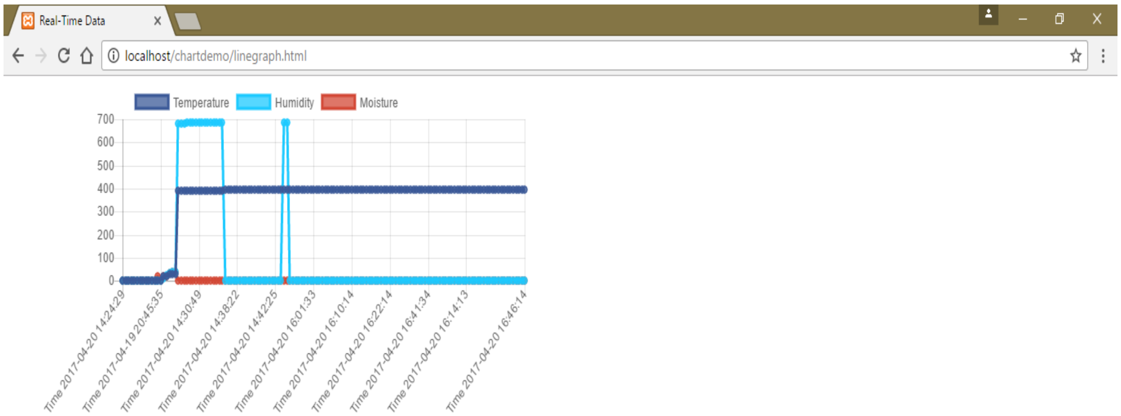


Prediction Page

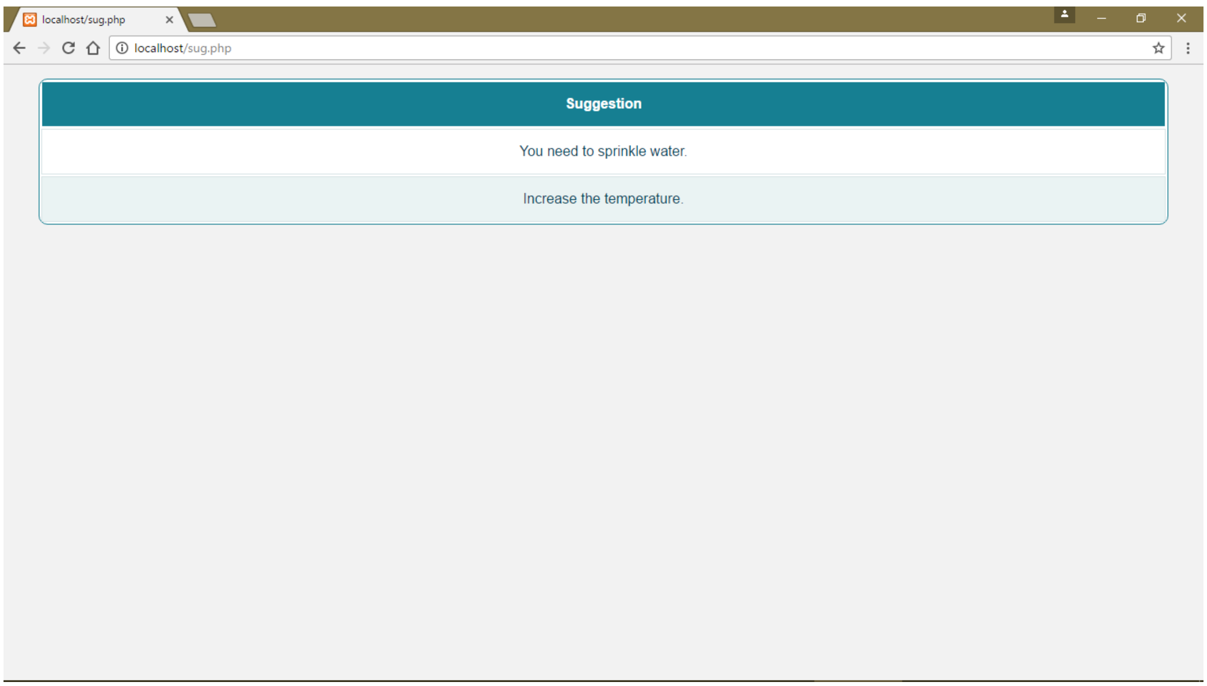


Month	Min Temp	Max Temp	Humidity	Sunshine Hours	Radiation	ETo
July	24	33	64	4	16	6
August	24	32	63	5	17	5
September	23	32	65	6	17	5
October	22	32	61	9	21	4
November	19	31	56	8	18	4
December	17	30	51	8	18	3

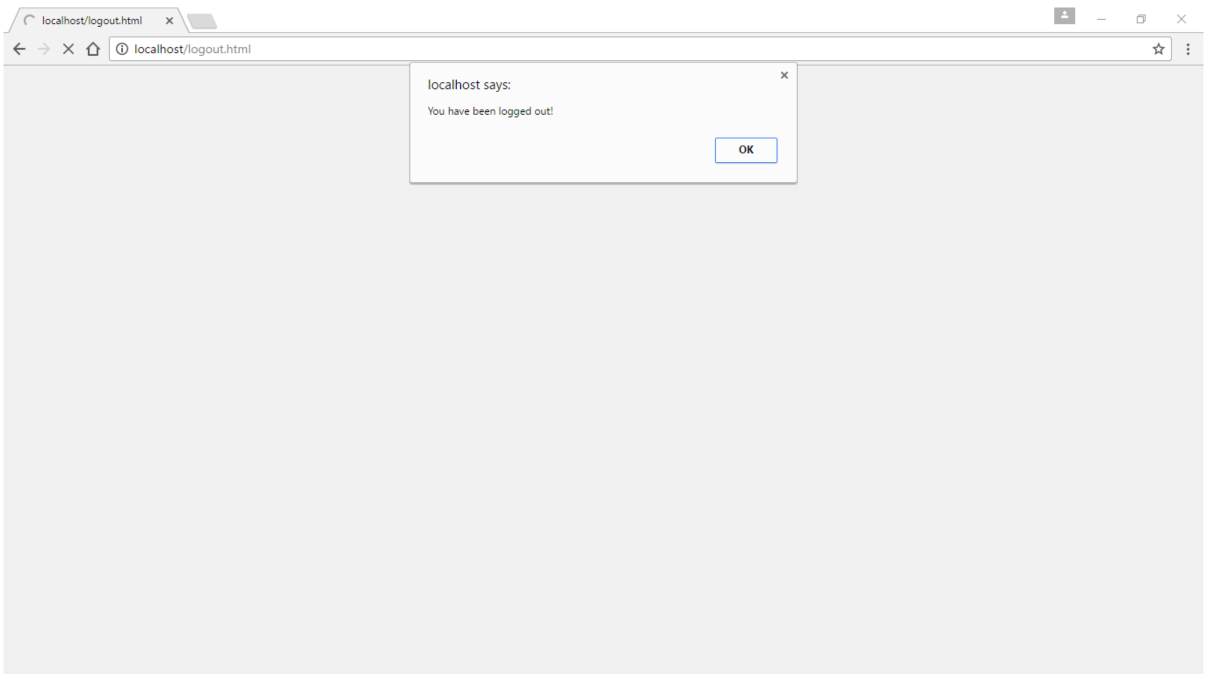
Graph plotted from sensor's data



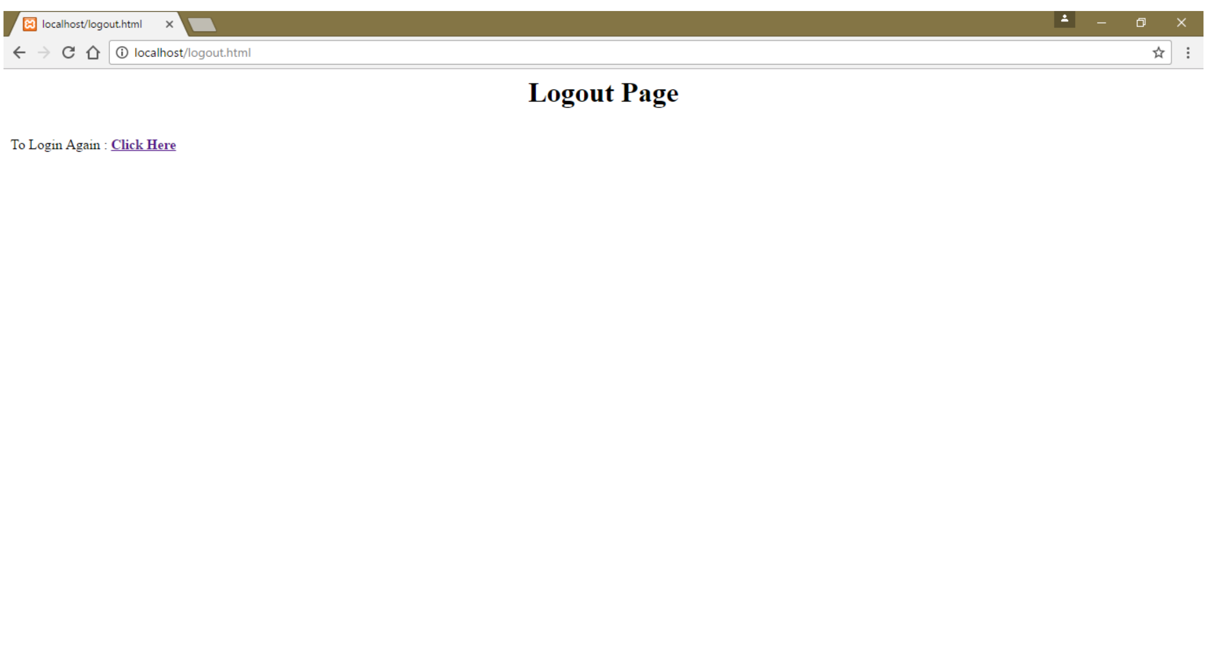
Suggestion Page



Logout Page



localhost/logout.html
localhost/logout.html
localhost says:
You have been logged out!
OK



localhost/logout.html
localhost/logout.html
Logout Page
To Login Again : Click Here

4.) Performance Analysis:

Temperature detecting parts utilize changes in pneumatic force, estimate, motor vitality, and of a protest gather the question by . Notwithstanding, genuine , components, for example, estimation run, precision, nature, likewise thought. segments are essentially utilized to measure barometrical temperature changes or in smaller scale frameworks .These temperature detecting segments are broadly utilized as a part of a wide range of connected research, in spite of the fact that the adverse environment inside cement with solid alkalinity and water penetrability this review implant segments cement.

Type	Details	Material	Measurement range	Common use	Limitations of the use in this study
Thermocouple	K-type	Ni-Cr alloy, Al-Ni alloy	−200 °C to 1,200 °C	Industrial measurement of high temperature	The greatest inconvenience in measuring building structures is the requirement for zero corrections of the temperature and the signal noise ratio formed by small analog voltage and noise at the output, resulting in signal processing difficulty.
	E-type	Ni-Cr alloy, Cu	−100 °C to 800 °C		
	J-type	Fe, W, Cu	−200 °C to 750 °C		
	R-type	Pt, Rh	0 °C to 1,700 °C		
IC temperature sensor		Semiconductor	−50 °C to 150 °C	Home appliance temperature control	At high temperatures, the output voltage shows indicial response.
Resistance Temperature Detector (RTD)		Mn, Ni, Cu, Pt	−50 °C to 300 °C	Industrial use (*i.e.*, Pt-100)	To achieve accurate temperature measurement, the electrical circuit design for signal processing is complicated.
Thermistor	NTC	Sintered by Mn, Cu, Co, Fe, Ni	−100 °C to 450 °C	Electronic switches	High non-linearity and non-homogeneity is usually applicable for switch behavior and is not applicable for achieving effective temperature monitoring by the temperature analog signal process.
	PTC	Zn	−50 °C to 150 °C		
	CTR	Ceramics, V, Ba, CS, P	0 °C to 150 °C		

4.1) Benefits of using Intel Galileo Gen 2 over Raspberry Pi and Arduino Development Boards:

Shield Compatibility

The expansion header on the top of Galileo should look familiar since it's compatible with 5V and 3.3V Arduino shields designed for the Uno R3 (also known as the Arduino 1.0 pinout). This means that it has 14 digital I/O pins, 6 analog inputs, a serial port, and an ICSP header.

Familiar IDE

The Intel-provided integrated development environment for the Galileo looks exactly like the Arduino IDE on the surface. Under the Boards menu, you'll see addition of the Galileo under "Arduino X86 Boards." The modified IDE also is capable of upgrading the firmware on the board.

Ethernet Library Compatibility

Using the Ethernet port on the board is as simple as using Arduino's Ethernet library. I was able to get a HTTP connection to Google without even modifying the standard Web Client example.

Real Time Clock

Most Linux boards rely on a connection to the Internet to get the current date and time. But with Galileo's on-board RTC (real time clock), you'll be able to track time even when the board is powered off. Just wire up a 3.0V coin cell battery to the board.

Works with PCI Express Mini Cards

On the bottom of the board is an expansion slot for PCI Express Mini cards. This means you can connect Wi-Fi, Bluetooth, GSM cards for connectivity, or even a solid state drive for more storage. When you connect a Wi-Fi card, it will work with Arduino's Wi-Fi library.

USB Host Port

Galileo's dedicated USB On-The-Go port will let you use the Arduino USB Host library to act as a keyboard or mouse for other computers.

Micro SD Support

If you want to store data, a micro SD card slot is accessible from your code by using the standard Arduino SD card library.

TWI/I2C, SPI Support

Using the standard Arduino Wire library or SPI library, you can connect TWI/I2C or SPI components to the Galileo.

Serial Connectivity

Not only is there the typical serial port for your sketches on pins 0 and 1 of the Arduino pinout, but there's also a separate serial port for connecting to the Linux command line from your computer. You'll connect to it through the audio jack interconnect next to the Ethernet port. This port is only used for serial.

Linux on Board

A very light distribution of Linux is loaded onto the 8 MB of flash memory. If you want to

The differences:

The Intel Galileo is a Arduino compatible board which has additional I/O ports: A full sized mini-PCI Express slot, 100Mb Ethernet port, Micro-SD slot, RS-232 serial port, USB Host port, USB Client port. In also has a lot more memory with 8MB NOR flash, 512 KB SRAM, 256 Byte DRAM and a faster 400MHz processor.

By comparison an Arduino Uno has 16MHz CPU, 32KB Flash Memory and 2KB Sram. The more powerful Due has 84MHz CPU, 512K Flash and 96K SRAM.

So the Galileo is a much faster board with lots more memory and IO capabilities. It also has a higher price tag £60 compared with around £20 for Uno and £40 for a Due. (Clones can be had for much less).

Both the Arduino and Galileo are micro-controllers and run the same software. This means they don't have an operating system, you upload a program from a computer via USB and that program runs each time you switch it on.

A Raspberry Pi is a very different machine. This is a proper computer with an operating system, and file system held on a flash drive. You can plug in keyboard, mouse and monitor and run software like a web-browsers on it. Its faster with a 900MHz processor and lots of memory 1GB RAM (Model 2). The downsize is it takes longer, a few 10 of seconds, to start up. Arduino are running as soon as power is applied. It costs a bit more than a Arduino but less than a Galileo at around £30.

Raspberry Pi is best for handling media such as photos or video, and a Galileo is an excellent choice if you have a project requiring sensors (and decent memory and processing power), monitoring, or have productivity-related applications (Galileo has a real time clock.) R Pi could be used as a networked security camera or a media server, but without an analog-to-digital converter, analog sensors would not be easy to implement. Galileo could be used to develop

smart everyday "things" with lots of sensors, such as watches, health monitoring or fitness devices, or simply be an inexpensive personal computer running Linux sans all things Arduino.

5.) <u>CONCLUSIONS</u>

5.1 Conclusions

The solution for monitoring agricultural environments isdescribed. Output of this project can be treated asthreatening system for imminent dangers, system always reportsstanding of farms or approval system for potentialplanters. Such system is appropriate to the network society .Moreover there is sufficient technical information to extract its enactmen It is both feasible and cost effective.

5.2) Future work

Steps are described below.

The growth of the platform board is necessary in order to make it more robust, thus manufacturing the board is important for the future progress of the system. A modular design that should give the opportunity to users of using energy sources, connectivity and sensors as modules could be a very useful and easy-to-use solution. A potential support of different platforms could also be an addition in the system that could spread the usage of the system with already applied solutions. Regarding the communication between the components of the system, a server-to-platform communication stream should be implemented. This direction of communication is not implemented for this prototype but it would be important to be implemented for updating the firmware or variables on platform. The analytics services should also include more complex tools. A schedule function should be implemented in order for the users to plan the frequency of the sensing for every sensor. A migration to the cloud for the server is important for the scalability of the system, as well. More complex tools like extending alerts to enable the use of functions, rather than simply local equations involving current sensor values could be a useful addition. These functions could even consider historic sensor values in order to identify patterns. The most important and useful job that has to be done is the real field testing for extended time and with several sensor platforms and sensors deployed in fields. This will provide feedback that could be meaningful for the further development of the system and would include the users' insights and real needs.

Following is done in this project

- Production offood by using this project must increase by 70 percent in the year 2050 in for meeting estimated world population of 11 billion people.
- Providinguseful data collectionhhigh-precision crop control,, and automated farming techniques

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