Smart Plant Monitoring System using IOT

A Project Report

Submitted in partial fulfillment of the requirements for the

Degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

By

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Konark Institute of Science & Technology

We Nurture The Talent...

CERTIFICATE

This is to certify that the work reported in the B.Tech project entitled "SMART PLANT MONITORING SYSTEM" which is being submitted by Abhishek Kumar (1701214106), Md Asif Jawed (1701214014), Md Kashan Ahmed (1701214134) and Md Jamshed Alam (1701214133) in fulfillment for the award of Bachelor of Technology in Computer Science and Engineering by Biju Patnaik University of Technology (BPUT), is record of Candidate's work carried out by him/her under my supervision.

.....

Guided by:

Mr. Subhashis Mishra

Assistant Professor, CSE, KIST

Table of content: -

LIST OF ACRONYMS AND ABBREVIATIONS

ABBREVIATIONS	FULL FORM
T&H	Temperature and Humidity
I/O	Input/Output
Hz	Hertz
V	Volts
IDE	Integrated Development Environment
KHz	Kilo-Hertz

LIST OF DIAGRAMS

DECLARATION BY THE SCHOLARS

We hereby declare that the work reported in the B-Tech thesis entitled **"SMART PLANT MONITORING SYSTEM"** submitted at **Konark Institute of Science and Technology, Bhubaneswar,** is an authentic record of our work carried out under the supervision of **Mr. Subhashis Mishra.** We have not submitted this work elsewhere for any other degree or diploma.

By-

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Acknowledgement

It is a pleasure that we find ourselves penning down these lines to express or sincere thanks to the people who helped us along the way in completing the project our project. We find inadequate words to express our sincere gratitude towards them.

First and foremost, we would like to express our gratitude towards our training guide
Mr. Subhashis Mishra for placing complete faith and confidence in our ability to carry out this project and for providing us her time, inspiration, encouragement, help, valuable guidance, constructive criticism and constant interest. He took personal interest in spite of numerous commitments and busy schedule to help us complete this project. Without the sincere and honest guidance of our respected project guide we would have not been able to reach the present age.

We are thankful to Dr. L.N Padhy (H.O.D, CSE dept) and Mr. Subhashis Mishra (Project Coordinator) for their support in guiding us and giving us the right direction every time we need.

ABSTRACT

Plant monitoring is seen as one of the most important tasks in any farming or agriculture-based environment. With the inception of Ambient Intelligent systems, there have been a rise in ambient intelligent based devices-Smart Homes and other similar technologies involving RFID has evolved over the past few years. Integration of such an ambient intelligent system with plant monitoring makes farming easier. In this project, we discuss about the implementation of a smart plant monitoring system which makes use of the concept ambient intelligence with the use of IOT which, proactively handles the plant monitoring system.

The given implementation works along with a cloud-based server and a mobile based device (ideally Android/iOS device) which helps the user to control and see the status of the plant which is being monitored by the hardware device. The given circuitry detects changes in the moisture, temperature and light conditions in and around the plant, and performs a machine-based curation on the plant by providing necessary irrigation and illumination for the plant.

IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity. It keeps various factors like humidity, temperature, soil etc. under check and gives a crystal-clear real-time observation.

1.INTRODUCTION

1.1 Introduction of Project

> This is an IoT based project that will be capable of analyzing various characteristics of soil such as moisture, temp, light etc. from anywhere using internet. This device will be installed in soil and data fetched by the device would be managed through an android/web application. This data will be analyzed and information about best gardening options for that particular plant will be provided by the app itself.

For some of us, plants are hard to keep alive and while there are all sorts of tech tricks to keeping plants alive, most of them are rather gaudy.

With the introduction of Industrial IoT in Agriculture, far more advanced sensors are being utilized. The sensors are no connected to the cloud via cellular/satellite network. Which lets us to know the real-time data from the sensors, making decision making effective. The advancement of IoT technology in agriculture operations has brought the use of sensors in every step of the farming process like how much time and resources a seed takes to become a fully-grown vegetable.

The **plant devices** that can e-mail you or notify you on app once thirsty, hot/cold, sleeping etc.

charge it like a cell phone, no prior gardening experience required.

Three things we must remember about plants. That Plants always accept the negative energy from the environment, keep the air fresh and clean, which is important and necessary for our health.

By using this device, we can find out description of the plant i.e., water level, temperature, moisture

1.2 Applicability of IOT in Agriculture

> Smart Farming is a hi-tech and effective system of doing agriculture and growing food in a sustainable way. It is an application of implementing connected devices and innovative technologies together into agriculture

With the recent agriculture trends dependent on agriculture, Internet of Things has brought huge benefits like efficient use of water, optimization of inputs and many more. What made difference were the huge benefits and which has become a revolutionized agriculture in the recent days.

IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity. It keeps various factors like humidity, temperature, soil etc. under check and gives a crystal-clear real-time observation.

1.3 Problem Statement

> This is an IOT based system to check the plant soil, temperature, water and cold level of plant using microcontroller and sensor, all these descriptions will be display on the android app, and all this information should be saved on cloud.

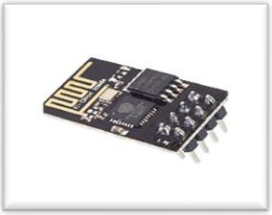
1.4 Objective of project: -

- The main objective of this project is using the hardware and software together.
- This project is used to implements the technology with nature.

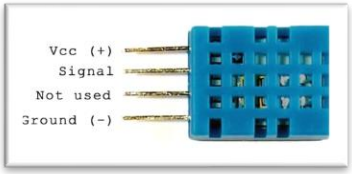
1.5 list of Components

- **Arduino uno (microcontroller)**

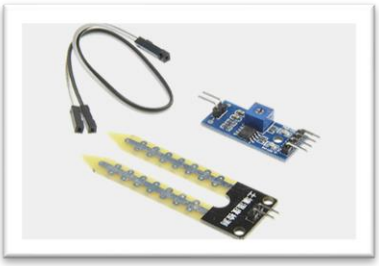
- **ESP-8266-01 Wi-Fi Module**



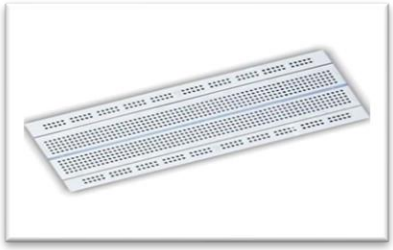
- **DHT-11 (Digital Humidity and Temperature Sensor)**



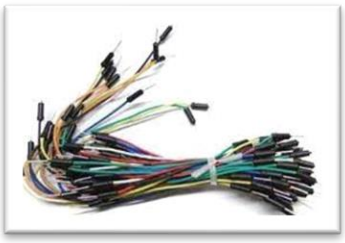
- **Soil Moisture Sensor module**



- **Breadboard**



- **Jumper wires**



1.6 Steps are used to make this project

Step 1: Circuit Diagram

> We have to design the circuit diagram based on the connection of sensors i.e. Temperature & humidity sensor and Soil moisture sensor module with the microcontroller with Wi-Fi module.

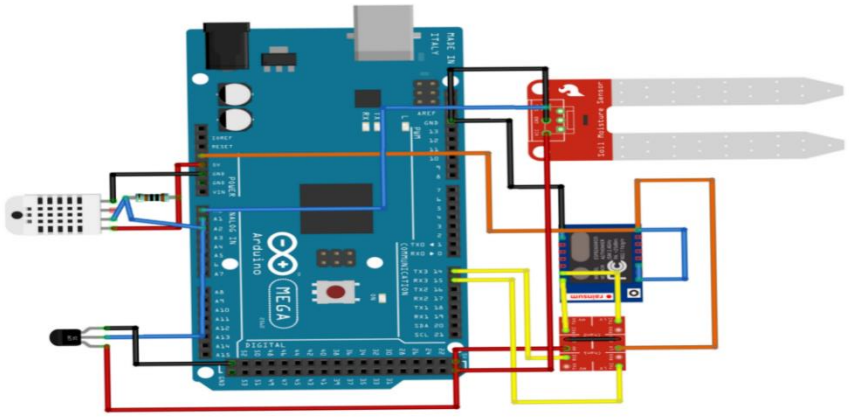
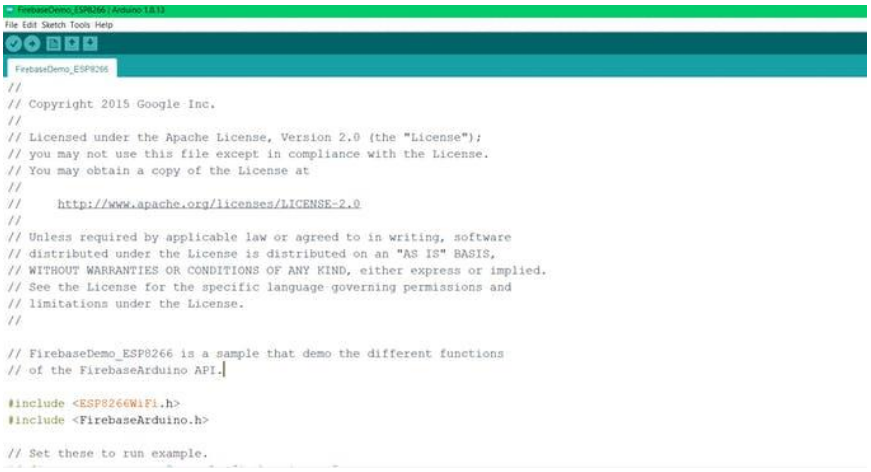


Fig 1

Step 2: Arduino Code

> In this step program coding is used in Arduino, which is used in the project, for this you may have good programming skill.



```
File Edit Sketch Tools Help

FirebaseDemo_ESP8266

//
// Copyright 2015 Google Inc.
//
// Licensed under the Apache License, Version 2.0 (the "License");
// you may not use this file except in compliance with the License.
// You may obtain a copy of the License at
//
//     http://www.apache.org/licenses/LICENSE-2.0
//
// Unless required by applicable law or agreed to in writing, software
// distributed under the License is distributed on an "AS IS" BASIS,
// WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
// See the License for the specific language governing permissions and
// limitations under the License.
//

// FirebaseDemo_ESP8266 is a sample that demo the different functions
// of the FirebaseArduino API.

#include <ESP8266WiFi.h>
#include <FirebaseArduino.h>

// Set these to run example.
```

Step 3: Sending data to database (Google Firebase)

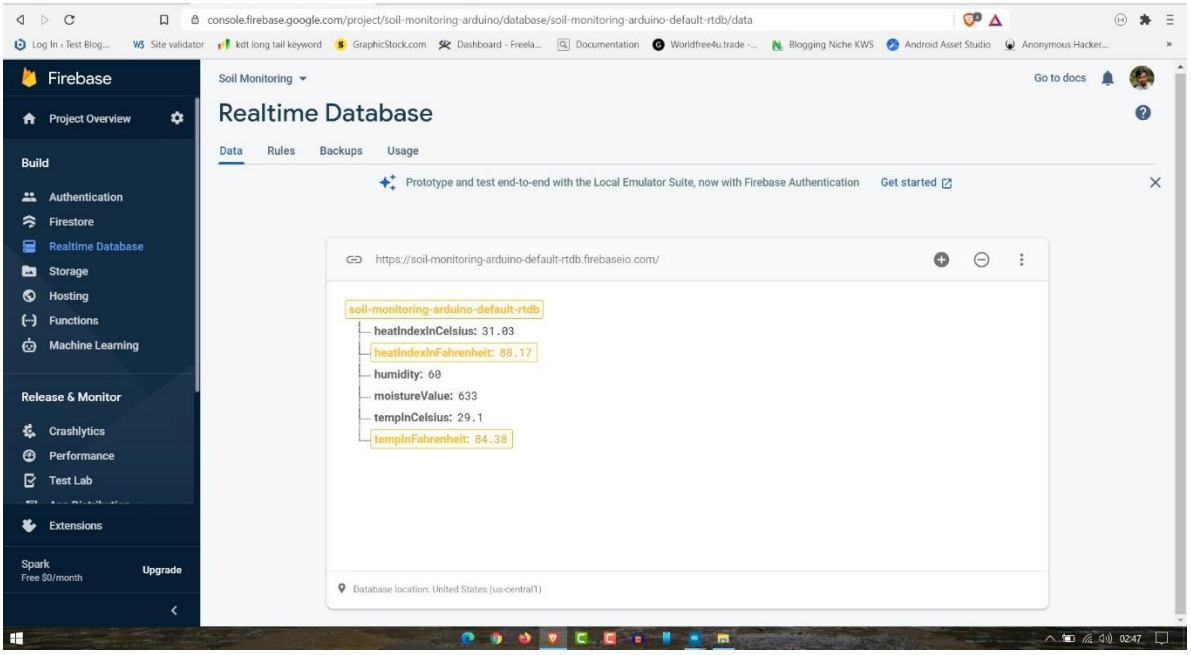


fig 2

Steps:

- make a database in Firebase.
- upload and download data from Firebase.
- use ESP8266 as a connection between Arduino and Firebase.

Step 4: android App design

> Showing data inside app.

In this step app is designed in this way that plant description will be show in better design like temperature, moisture, water level, cold and hot level etc.

Step 5:

> Now in this step after seen everything about the plant, we must water the plant and seeds the plants for the plant's growth

Conclusion:

> After slight research, we conclude that why people fail to grow plants, they cannot understand the main reason behind the plants are not growing, they forgot the nature, this is very obvious, so we decide to make smart plant device which automatically give report about the plant.

1.7 Methodology

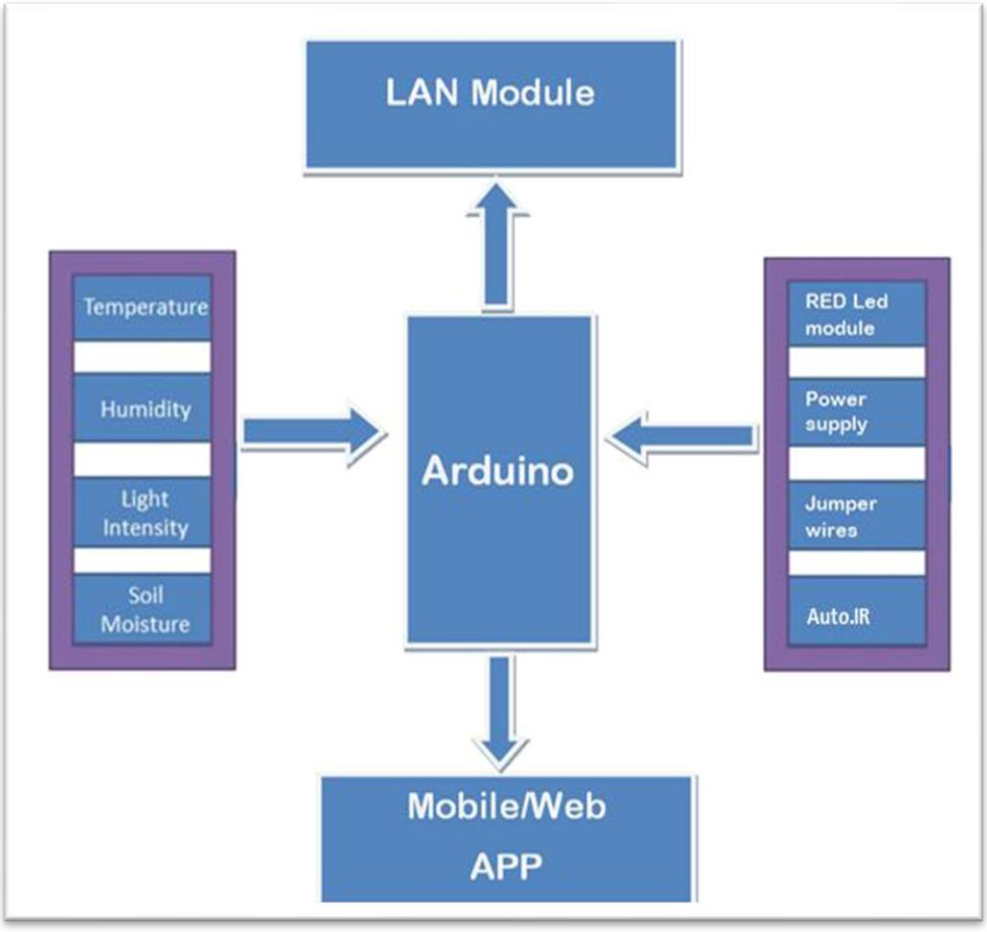


Fig 3

2.LITERATURE SURVEY FOR HARDWARE AND SOFTWARE REQUIREMENTS

2.1: Android 

2.1.1 Introduction

> Android products are widely used in our daily life such as mobile phones, televisions, tablets etc. Basically, an android is an open source which means it is available for every platform. Also, it is a type of Linux based operating system for smart phones and tablet computers.

The Open Handset Alliance has developed it. Android provides a platform to all the application developer to develop their applications and that can be run on different devices of android.
In 2007, Google has launched the first beta version of Android SDK (Software Development kit). Also, in September 2008, Google has launched the first Android 1.0 commercial version.

2.1.2 Benefits of Android

> The first basic advantage of android is that it is an open source and the code is available for free for Android developers. It provides a very attractive and good user interface for users. For data storage, a lightweight database is available name as SQLite (Structured Query Language), basically used to store and retrieve data in a database.

An android supports great features such as messaging, connectivity, real time messaging (as Google Cloud Messaging), Wi-Fi direct etc. There are many android applications are available in the market now a days. Some of are: -News, Sports, music,

multimedia, travel, etc.

2.1.3 Android Versions

> Android versions are related to different code names such as

Code name	Version	API level
Oreo	8.1.0	API level 27
Oreo	8.0.0	API level 26
Nougat	7.1	API level 25
Nougat	7.0	API level 24
Marshmallow	6.0	API level 23
Lollipop	5.1	API level 22
Lollipop	5.0	API level 21
KitKat	4.4 - 4.4.4	API level 19
Jelly Bean	4.3.x	API level 18
Jelly Bean	4.2.x	API level 17
Jelly Bean	4.1.x	API level 16
Ice Cream Sandwich	4.0.3 - 4.0.4	API level 15, NDK 8
Ice Cream Sandwich	4.0.1 - 4.0.2	API level 14, NDK 7
Honeycomb	3.2.x	API level 13
Honeycomb	3.1	API level 12, NDK 6
Honeycomb	3.0	API level 11
Gingerbread	2.3.3 - 2.3.7	API level 10
Gingerbread	2.3 - 2.3.2	API level 9, NDK 5
Froyo	2.2.x	API level 8, NDK 4
Eclair	2.1	API level 7, NDK 3
Eclair	2.0.1	API level 6
Eclair	2.0	API level 5
Donut	1.6	API level 4, NDK 2
Cupcake	1.5	API level 3, NDK 1

2.1.4 Making New Activity and Passing Data

Intent

> Intent is a part of android application which is used to make relations between activities into an app. Generally, it is used to link one activity of an app to other activities of the app. A bunch of code is need to write to open other activity of that app. The sample code for MainActivity class is given below:

```
Intent intent = new Intent (MainActivity.this, SecondActivity.class);
startActivity(intent);
```

As you may see on the above code, first we use an object of intent with their parameters and after that we pass the object in startActivity method. Actually, the startActivity method helps to move the user from MainActivity to SecondActivity.

Bundles

> Generally, if we wish to pass a value or data between two activities, we use bundles. A Bundle passes the value in next activity, without any data type restrictions, with the help of intent. putExtra Method is used for sending the data between activities such as

```
Intent intent = new Intent(MainActivity.this, SecondActivity.class);

Intent.putExtra("Key", value);

startActivity(intent);
```

As you can see above sample code, the data is passed by putExtra method with two parameters, key and value. The key defines the specific nAAAAAAAAAAame of that value which we wish to pass in activities and the value is depending on the user requirement.

Also, we can find or get the passed data from previous activity to next activity by

bundle.

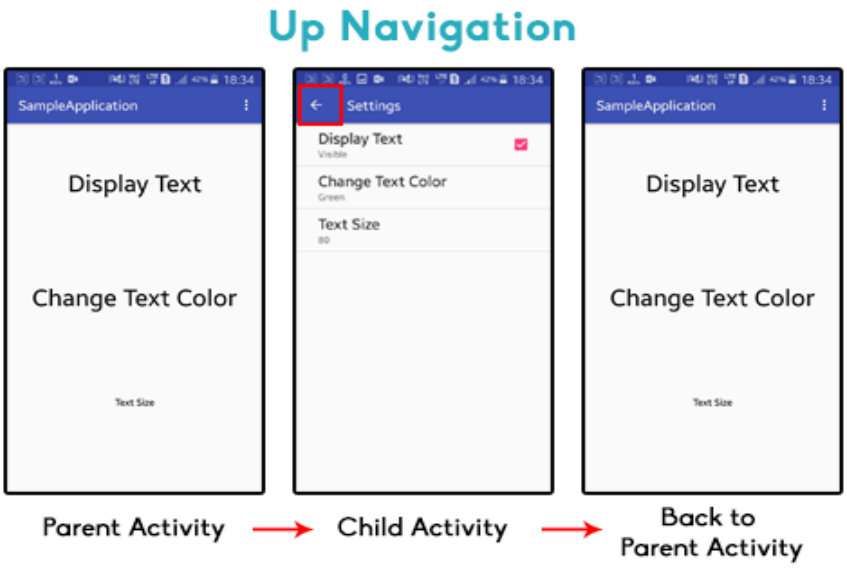
Here is the sample code for it:

```
Intent intent = getIntent();
Bundle data = intent.getExtras();
If (data ! = null)
{
String fetchData = (String) intent.get("Key");
}
```

As per the above code, first we need to make an intent object to get the intent which has the data by using getIntent( ) method. And after that we use bundle object and add the passed values into it.

SharedPreference

Android provides different methods to pass and store the data in activities. Shared preference is also a part of it. By using key and value pair, you can retrieve/save data in shared preference. The method use for shared preference



2.2 JAVA 

> Java is a programming language and environment invented by James Gosling and others in 1994. Java was originaly named Oak in 1992. (electronic devices)

2.2.1 Features of JAVA

1. Simple

- java inherits syntax from c and oops concepts from c++.

2. Object oriented

- Java is truly oops language c++ is not everything in java is defined inside a class.
- We cannot write programme without using class & objects, even the main function is also defined inside a class.

Other Features

- Write code once and run it on almost any computing platform.
- Java is platform-independent. Some programs developed in one machine can be executed in another machine.
- It is a multithreaded language with automatic memory management.
- It is created for the distributed environment of the Internet.
- Facilitates distributed computing as its network-centric.

➢ We can write Android apps in the Java programming language using an IDE called Android Studio

2.2.2 Compilation and Execution of java Program

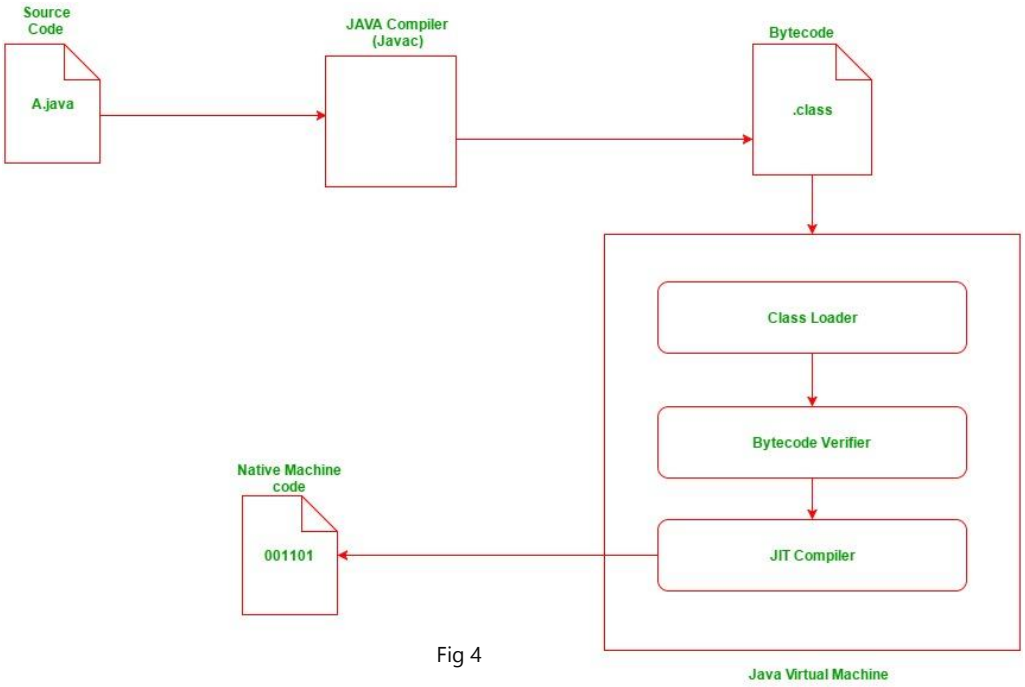


Fig 4

2.2.3 Android Compilation Process

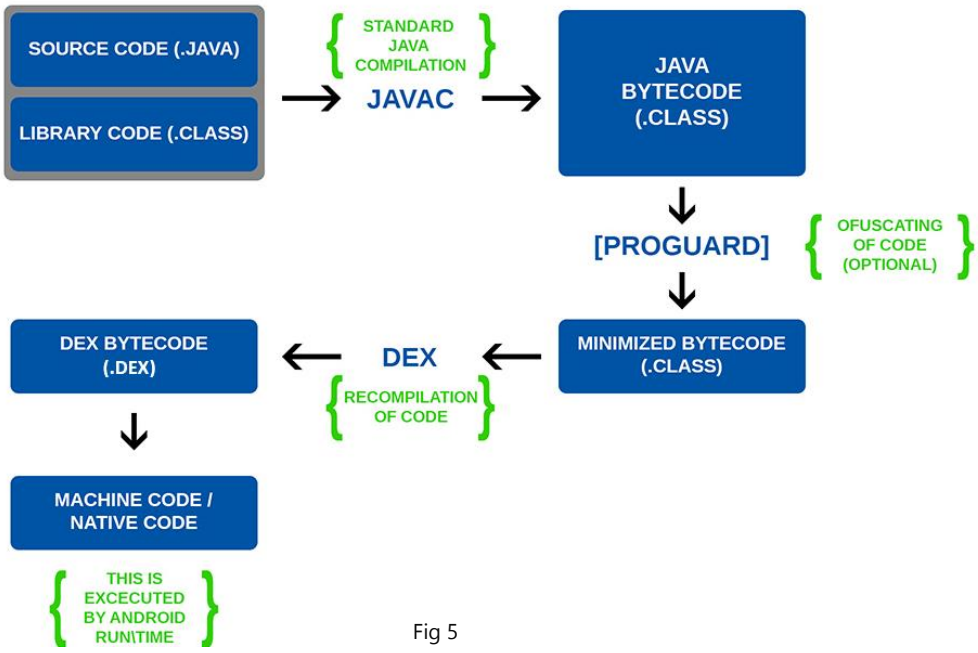


Fig 5

2.3 Arduino

2.3.1 Introduction

- Arduino is an open-source electronics platform based on easy-to-use hardware and software.

- Arduino code is written in C++ with an addition of special methods and functions, which we'll mention later on. C++ is a human-readable programming language. When you create a 'sketch' (the name given to Arduino code files), it is processed and compiled to machine language.

2.3.2 Arduino IDE

> The Arduino Integrated Development Environment (IDE) is the main text editing program used for Arduino programming. It is where you'll be typing up your code before uploading it to the board you want to program. Arduino code is referred to as sketches.

2.3.3 From Software to Hardware

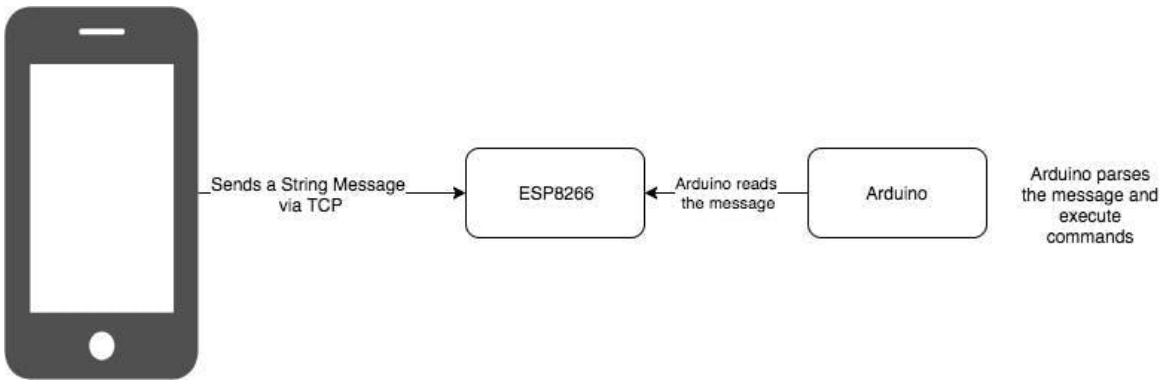
> There is a lot to be said of Arduino's software capabilities, but it's important to remember that the platform is comprised of both software and hardware. The two work in tandem to run a complex operating system.

Code → Compile → Upload → Run

At the core of Arduino, is the ability to compile and run the code.

After writing the code in the IDE you need to upload it to the Arduino. Clicking the Upload button (the right-facing arrow icon), will compile the code and upload it if it passed compilation. Once your upload is complete, the program will start running automatically.

Arduino → ESP8266 → Firebase → Android app



2.4 Firebase

2.4.1 Introduction

> Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products which are used by 1.5 million apps.

Firebase provides multiple services as following:

- Firebase Analytics which is a free application measurement solution providing insight into app usage and user engagement.
- Firebase Cloud Messaging (FCM) which is a cross-platform solution for messages and notifications for Android, iOS, and web applications, which is cost-free as of 2016.
- Firebase Auth which is a service that can authenticate users using only client-side code. It supports social login providers Facebook, GitHub, Twitter and Google (and Google Play Games). Moreover, it includes a user management system whereby developers can enable user authentication with email and password login stored with Firebase.

2.4.2 Connecting Arduino To Firebase

> You can read or transfer data from your database by Arduino and ESP8266. You need a Host name and an Auth key of your firebase project. Then, you should add the Firebase Arduino library and upload the code. If it's the first time you are using an Arduino board, just follow these steps:

- Go to www.arduino.cc/en/Main/Software and download the Arduino software compatible with your OS. Install the IDE software as instructed.
- Run the Arduino IDE and clear the text editor and copy the following code in the text editor.
- Choose the board in: tools > boards, and select your Arduino Board.
- Connect the Arduino to your PC and set the COM port in tools > port.
- Press the Upload (Arrow sign) button.
- You're all set!

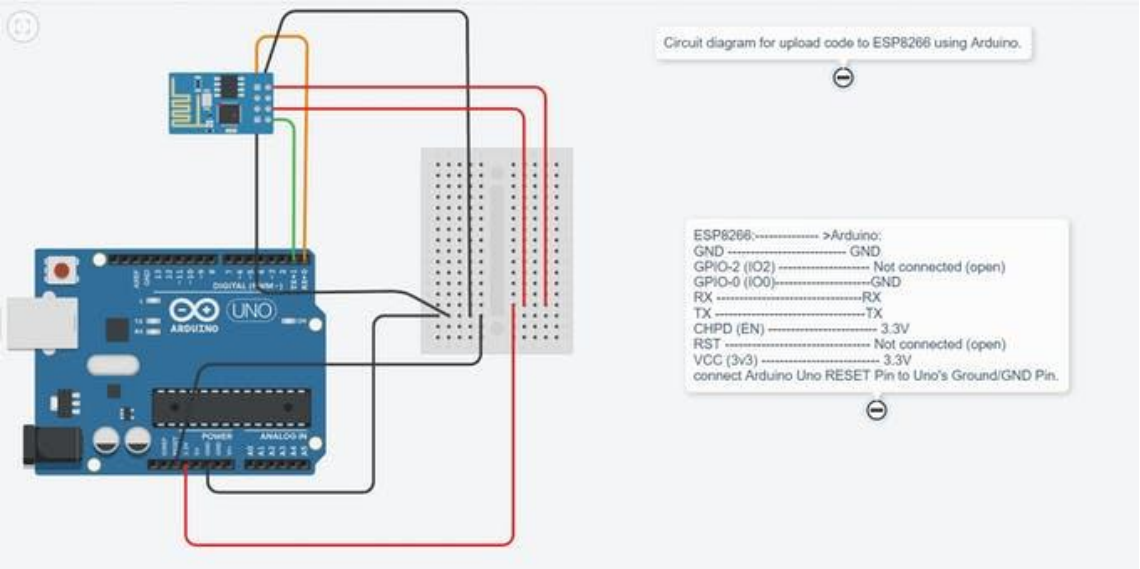

Circuit diagram for upload code to ESP8266 using Arduino.
ESP8266:---------- >Arduino:
GND ---------- GND
GPIO-2 (IO2) ---------- Not connected (open)
GPIO-0 (IO0)----------GND
RX ----------RX
TX ----------TX
CHPD (EN) ---------- 3.3V
RST ---------- Not connected (open)
VCC (3v3) ---------- 3.3V
connect Arduino Uno RESET Pin to Uno's Ground/GND Pin.

Fig 6

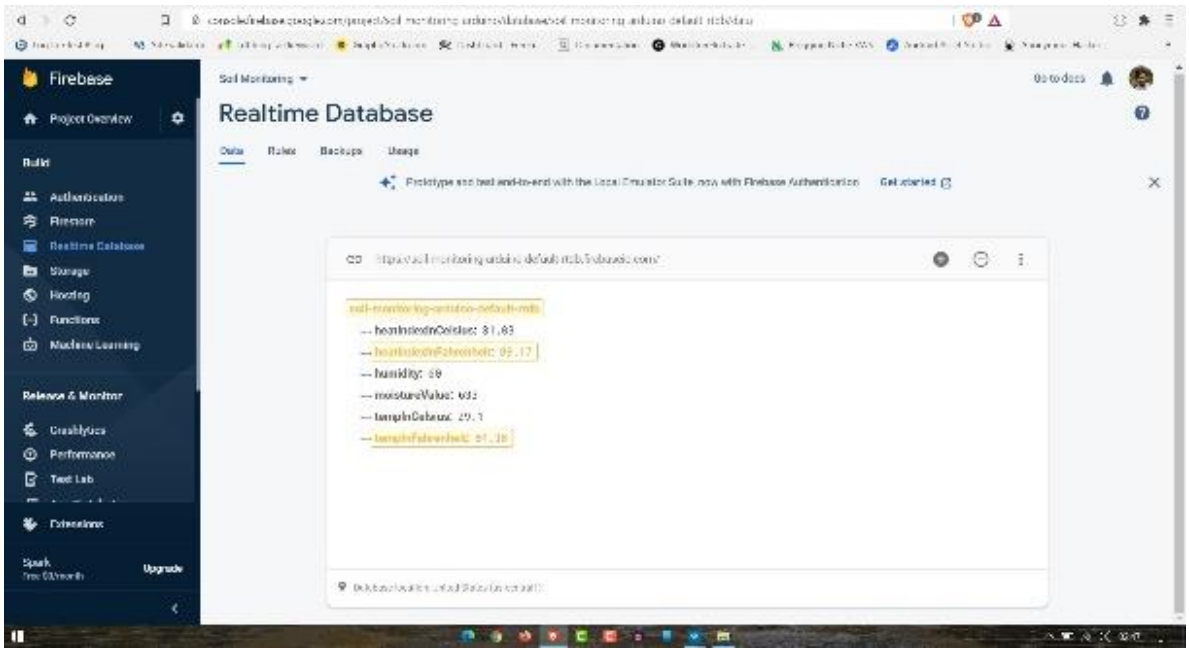

Firebase
Project Overview
Build
Realtime Database
Data
Rules
Backups
Usage
Release & Monitor
Upgrade

Fig 7

3. SYSTEM DEVELOPMENT

3.1 System Development Life Cycle (SDLC)

3.1.1 Planning

> This is the first phase in the systems development process. It identifies whether or not there is the need for a new system to achieve a business's strategic objectives. This is a preliminary plan (or a feasibility study) for a company's business initiative to acquire the resources to build on an infrastructure to modify or improve a service. The company might be trying to meet or exceed expectations for their employees, customers and stakeholders too. The purpose of this step is to find out the scope of the problem and determine solutions. Resources, costs, time, benefits and other items should be considered at this stage.

3.1.2 Analysis and Requirements

> The second phase is where businesses will work on the source of their problem or the need for a change. In the event of a problem, possible solutions are submitted and analyzed to identify the best fit for the ultimate goal(s) of the project. This is where teams consider the functional requirements of the project or solution. It is also where system analysis takes place—or analyzing the needs of the end users to ensure the new system can meet their expectations. Systems analysis is vital in determining what a business's needs are, as well as how they can be met, who will be responsible for individual pieces of the project, and what sort of timeline should be expected.

- CASE (Computer Aided Systems/Software Engineering)
- Requirements gathering
- Structured analysis

3.1.3 Systems Design

> The third phase describes, in detail, the necessary specifications, features and operations that will satisfy the functional requirements of the proposed system which will be in place. This is the step for end users to discuss and determine their specific business information needs for the proposed system. It's during this phase that they will consider the essential components (hardware and/or software) structure (networking capabilities), processing and procedures for the system to accomplish its objectives.

3.1.4 Development

> The fourth phase is when the real work begins—in particular, when a programmer, network engineer and/or database developer are brought on to do the major work on the project. This work includes using a flow chart to ensure that the process of the system is properly organized. The development phase marks the end of the initial section of the process. Additionally, this phase signifies the start of production. The development stage is also characterized by instillation and change. Focusing on training can be a huge benefit during this phase.

3.1.5 Integration and Testing

> The fifth phase involves systems integration and system testing (of programs and procedures)—normally carried out by a Quality Assurance (QA) professional—to determine if the proposed design meets the initial set of business goals. Testing may be repeated, specifically to check for errors, bugs and interoperability. This testing will be performed until the end user finds it acceptable. Another part of this phase is verification and validation, both of which will help ensure the program's successful completion.

3.1.6 Implementation

> The sixth phase is when the majority of the code for the program is written. Additionally, this phase involves the actual installation of the newly-developed system. This step puts the project into production by moving the data and components from the old system and placing them in the new system via a direct cutover. While this can be a risky (and complicated) move, the cutover typically happens during off-peak hours, thus minimizing the risk. Both system analysts and end-users should now see the realization of the project that has implemented changes.

3.1.7 Operations and Maintenance

> The seventh and final phase involves maintenance and regular required updates. This step is when end users can fine-tune the system, if they wish, to boost performance, add new capabilities or meet additional user requirements.

3.2 Android App

> First User will install the app on its android phone. Then after installing the app, app will open the and Then it will show the first activity which is the welcome activity it will show for 5 seconds and show the app logo with hey there text below it.

Fig 8

After 5 seconds the welcome screen will disappear and it will direct to the Activity Based on the first run it will open the activity which will show you to ACCESS PLANT database which is created in firebase database.

To view the conditions of plant of the values of sensor i.e. Temperature & Humidity sensor, Light sensor and Soil moisture sensor user just have to click on the plant name and the onClickListener listens it redirect the user to the next activity which will show the values of sensors in 4 different tab layout

Fig 9

Tab 1: Humidity

This Tab will show the percentage of Humidity of plants atmospheres

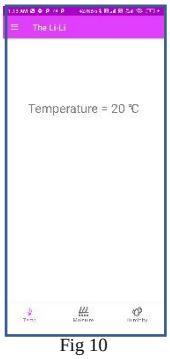


Fig 10

Tab 2: Temperature

It will show the temperature of the plant in Degree Celsius.

Fig 11

Tab 3: Water

It will show the Soil moisture of the plant in percentage in a numeric value.

4. HARDWARE

4.1 Arduino UNO

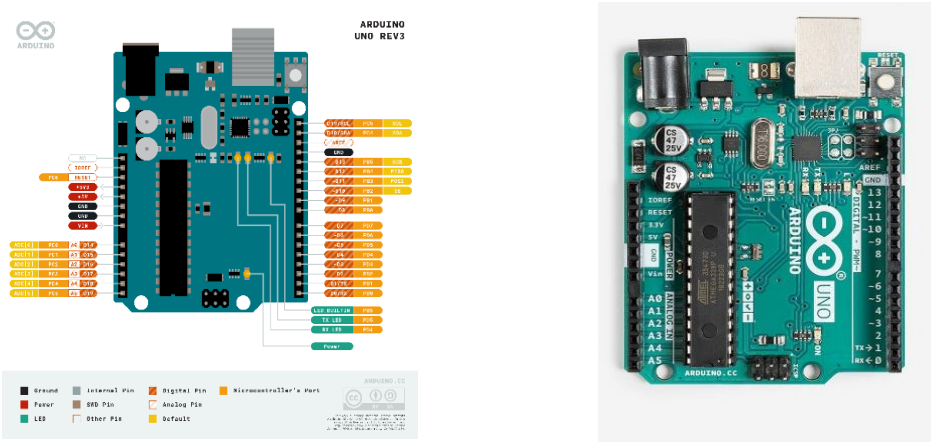


Fig 12

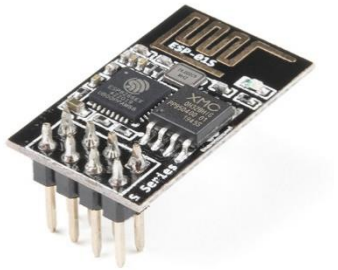
4.1.1 Introduction

> Arduino Uno is a microcontroller board. It has 14 digital input/output 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset
button. It contains everything needed to support the microcontroller; simply connect it to a
computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.
This is the latest revision of the basic Arduino USB board. It connects to the computer with a standard USB cable and contains everything else you need to program and use the board. It can be extended with a variety of shields.

4.1.2 Arduino specs

Operating Voltage	5V
Input Voltage (limit)	6-20V
Analog Input Pins	6
DC Current per I/O Pin	20 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz

4.2 ESP-8266-01 Wi-Fi Module



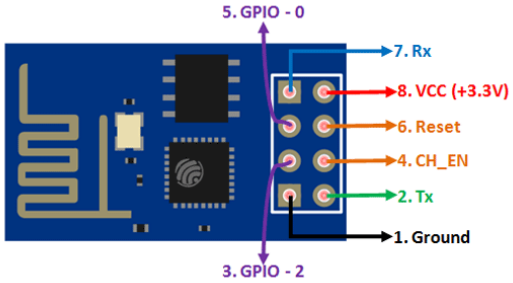


Fig 13

4.2.1 Introduction

> The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

4.2.2 Pin Description

3V3 : - 3.3 V Power Pin.
GND : - Ground Pin.
RST : - Active Low Reset Pin.
EN : - Active High Enable Pin.
TX : - Serial Transmit Pin of UART.
RX : - Serial Receive Pin of UART.

GPIO0 & GPIO2: - General Purpose I/O Pins. These pins decide what mode (boot or normal) the module starts up in. It also decides whether the TX/RX pins are used for Programming the module or for serial I/O purpose.

To program the module using UART, Connect GPIO0 to ground and GPIO2 to VCC or leave it open. To use UART for normal Serial I/O leave both the pins open (neither VCC nor Ground).

4.2.2 Setup Esp8266-01 on an Arduino

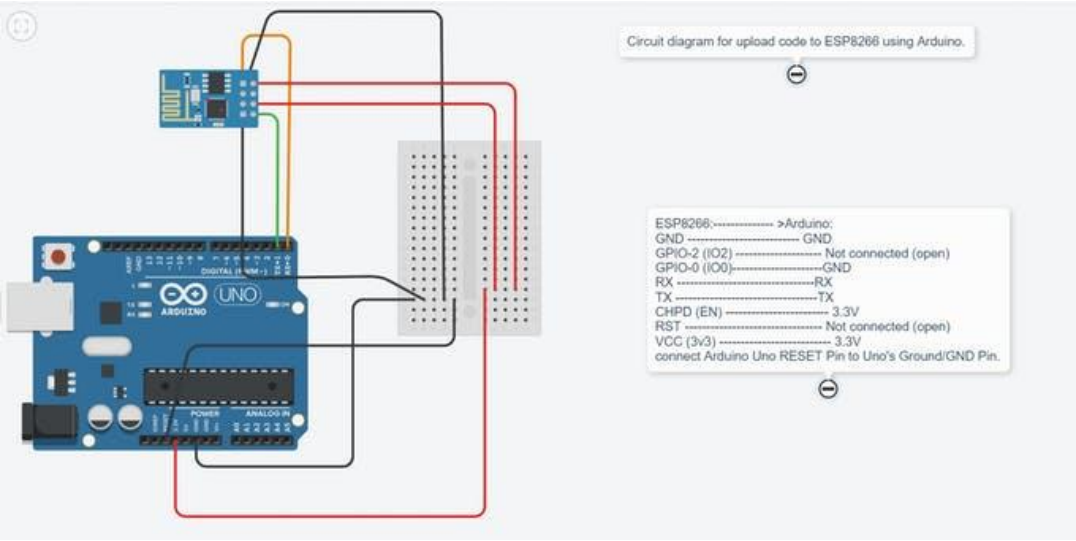


Fig 14

4.3 DHT-11 (Digital Humidity and Temperature Sensor)

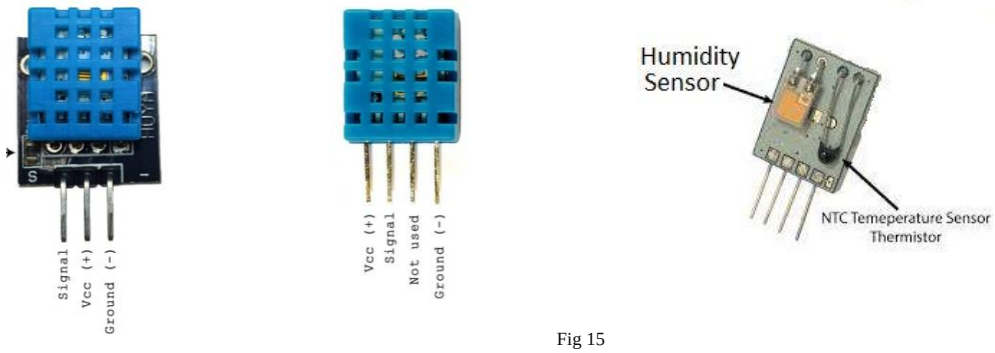


Fig 15

> The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).
The DHT11 humidity and temperature sensor make it really easy to add humidity and temperature data to your DIY electronics projects. It's perfect for remote weather stations, home environmental control systems, and farm or garden monitoring systems.

It's fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, the sensor readings can be up to 2 seconds old.

4.3.1 Technical Details

- to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)

4.3.2 Setup DHT11 on an Arduino

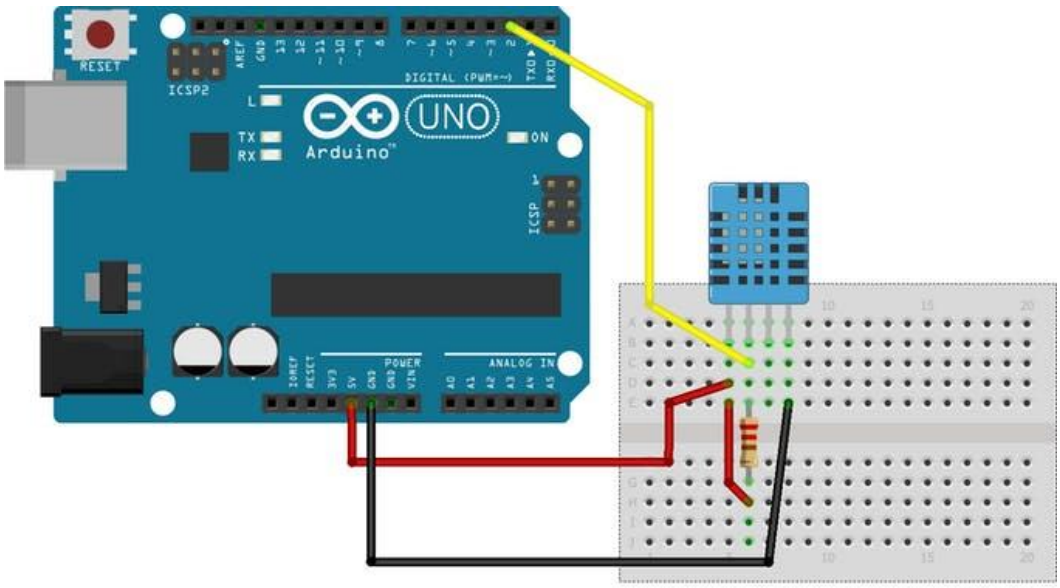


Fig 16

4.4 Soil Moisture Sensor module

Fig 17

>The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise, interaction with neutrons, and replacement of the moisture content.
Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out.

4.4.1 Setup soil moisture sensor module on an Arduino

Fig 18

4.5 Breadboard and jumper wires

Fig 19

> A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end which is normally used to interconnect the components of a breadboard.

Circuit implementation

The implementation of the electronic circuitry involved the computerized simulation (using Arduino) of the system design, physical implementation of the circuit using a breadboard to ensure proper operation and the final implementation of the circuit on a bread board.

5. CONCLUSION AND FUTURE OUTLOOK

Conclusion

Our conclusion about the case study of planets is that most of the people could not know how to take care of their plants, when and what amount to water and sunlight their plants need, what kind of plants are most suitable for their environment.

So, we developed a smart plant device which will take care of it and remind the user what to do and when to do. It sends all necessary data (temperature, humidity, moisture of soil) of the plants to the android application and user will visit all the details just by opening app at any time and place.

Results

The hardware is connected with all the sensors in the board. The hardware components include the microcontroller (Arduino uno), Wi-Fi module, Digital Humidity and temperature sensor and soil moisture sensor are interfaced.

The output denotes the temperature, soil moisture condition, humidity and heat index. The result can be seen inside the Android Application. It shows the temperature, humidity, moisture of the soil and calculate heat index.

FUTURE OUTLOOK

For future outlook, we can add functionalities like

- Automatic watering system
- Adding a kind of virtual assistant to plant by upgrading Arduino with raspberry pi combining virtual assistant with plant data so that it can talk to the peoples, it will be too much interesting to watching plant asking for the water when they needed.
- Also, we can add details about which is the most suitable plant for their location, by adding map or with the use of phone's GPS we can get the location, next by finding whether condition of that location and after finding weather condition we can give details about which plant will be most suitable for their location.

References:

[1] Zhao J, Zhang J, Feng Y, et al. The study and application of the IOT technology in agriculture[C]. Computer Science and Information Technology (ICCSIT).

[2] create.arduino.cc

[3] stackoverflow.com

[4] youtube.com

[5] Wikipedia