

A Project report

On

Application of Digitally enabled Smart Farming Practices to Green house initiatives.

Submitted By

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1.INTRODUCTION.

Aim: The main objective of this project is to give the user(farmer) ability to access temperature and humidity of their nursery from anywhere

Agriculture is the broadest economic sector and plays an important role in the overall economic development of a nation. Technological advancements in the arena of agriculture will ascertain to increase the competence of certain farming activities. In this paper, we have proposed a novel methodology for smart farming by linking a smart sensing system through wireless communication technology. Our system focuses on the measurement of physical parameters such as Temperature and Humidity of the Greenhouse that plays a vital role in farming activities. The main idea of this paper is focused on the review of the improvement in the Smart Farming sector.

1.1 Problem statement.

Greenhouse, an urban farming approach, provides farmers with an option to provide optimum cultivation condition by offering a controlled environment according to the crop's requirements. However, many farmers fail to get good profits and desired yield from greenhouse crops because they cannot efficiently monitor and control important factors like Humidity, temperature etc., that determine plant growth and productivity.

1.2 SOME MAJOR PROBLEMS FACED BY TRADITIONAL FARMING:

1. Temperature going higher or below than a certain degree.
2. High humidity – resulting in crop transpiration.

2.Overview.

At present there are few companies investing in the Agricultural sector, the companies are as follow

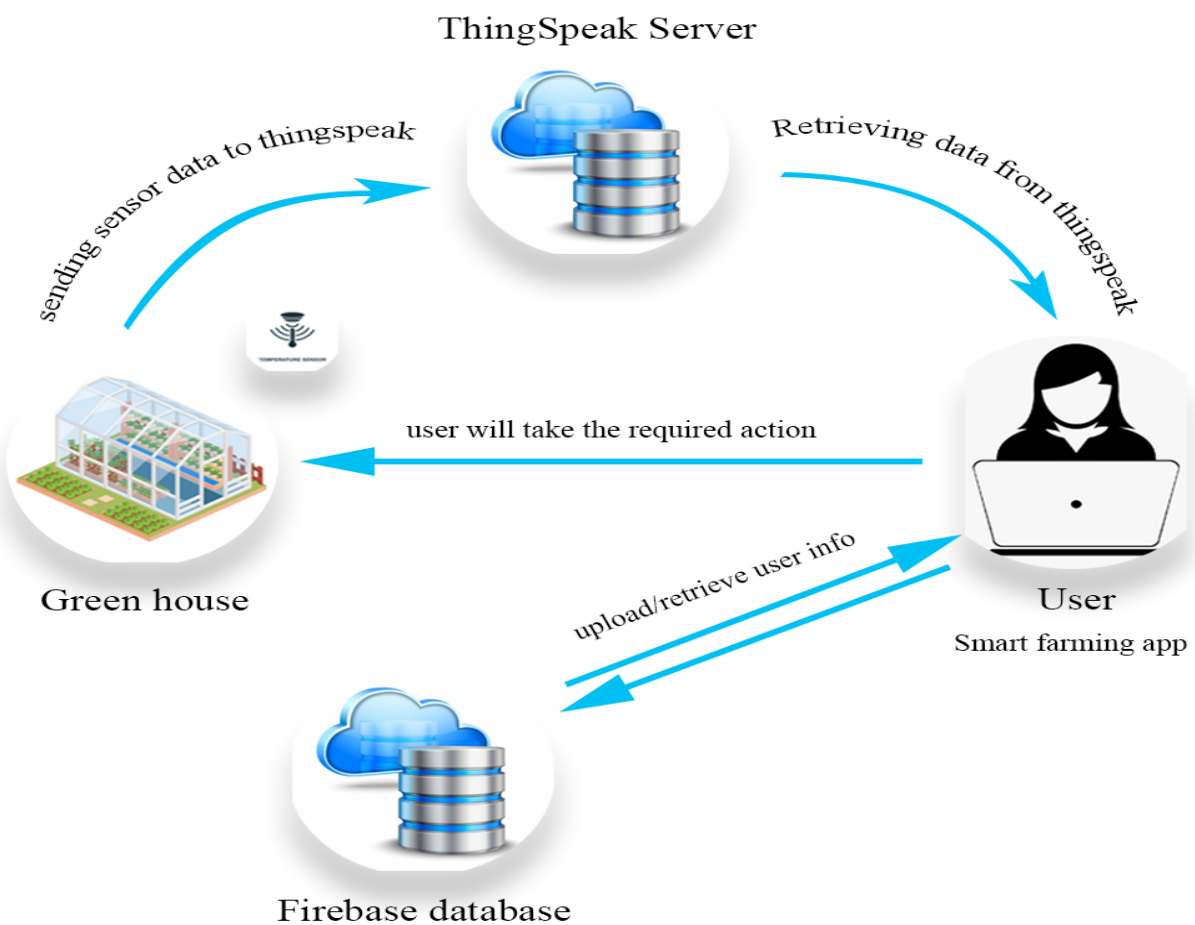
1. **Hortau** is a wireless soil and irrigation management platform. Hortau integrates with ST field monitors which can connect to irrigation infrastructure to perform tasks such as starting pumps on-demand, based on a schedule, or based on soil conditions.
2. **Pycno** offers wireless, modular soil sensors for use in determining what the soil needs so that farmers can use only the fertilizer and other additives they need in order to reduce waste.
3. **The Yield** focuses on ensuring that the growing conditions on a farm are kept to a certain standard. The Yield offers a free app that helps users remain aware of the weather conditions.
4. **Grownetics** assists with the installation of indoor crop monitoring equipment to maximize growing efficiency. Grownetics uses fog networking.

2.1 Things used In this project:

1. Dht11 – is a sensor used to collect temperature and humidity data
2. Arduino Uno - microcontroller board based on the ATmega328P
3. Esp8266 – WIFI module
4. Android studio – to develop/create android application
5. Firebase – to store user login information
6. Thingspeak – server to store the values provided by the sensors

3.Working of Project.

- First, dht11 sensor will read the temperature and humidity data
- The data collected by the sensor sent to thingspeak server using Arduino and esp8266
- From thing speak the data will be retrieved by the android app
- User will be notified by notification, if the temperature exceeds the limits.

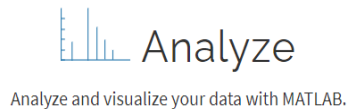


4.ThingSpeak Cloud.

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak.

According to its developers, “ThingSpeak is an open-source Internet of Things application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network.

https://thingspeak.com/pages/learn_more

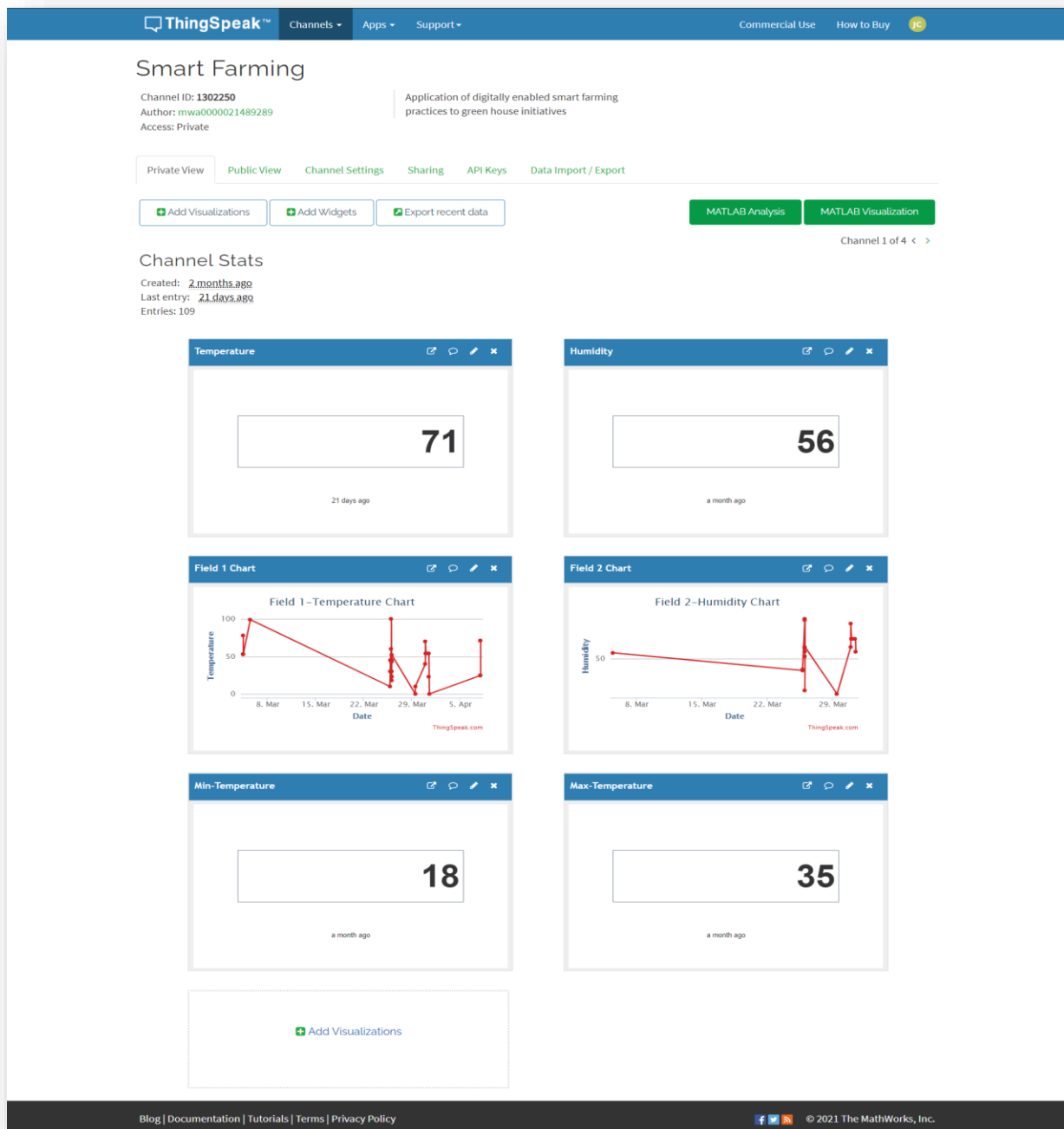


4.2 Working of Thingspeak.

In order to use thinkspeak cloud we are required to create an account, channel and channel fields

- Channel – a channel is where you send your data to store.
- Channel field – Each channel includes 8 fields for any type of data. Once you have a ThingSpeak Channel you publish data to the channel, have ThingSpeak process the data, then have your application retrieve the data.

HOME PAGE.



- Home page will show you the real time values of fields that been created
- If not showing go to add visualization or add widgets to add visualizer or numeric display, lamp indicator gauge.

API KEYS.

The screenshot shows the ThingSpeak interface for a channel named 'Smart Farming'. The channel ID is 1302250, the author is mwa0000021489289, and the access is Private. The 'API Keys' tab is selected, showing two sections: 'Write API Key' and 'Read API Keys'. The 'Write API Key' section displays a key 'QF8Q00YY80103YM0' and a button to 'Generate New Write API Key'. The 'Read API Keys' section displays a key '6MX5HCI6T5EDHHKY', a 'Note' field, and buttons for 'Save Note' and 'Delete API Key'. A button to 'Add New Read API Key' is also present. Red arrows point to the 'Smart Farming' channel name, the 'Write API Key' section, and the 'Read API Keys' section.

ThingSpeak™ Channels Apps Support

Smart Farming

Channel ID: 1302250
Author: mwa0000021489289
Access: Private

Application of digitally enabled s practices to green house initiativ

Private View Public View Channel Settings Sharing API Keys Data I

Write API Key

Key QF8Q00YY80103YM0

Generate New Write API Key

Read API Keys

Key 6MX5HCI6T5EDHHKY

Note

Save Note Delete API Key

Add New Read API Key

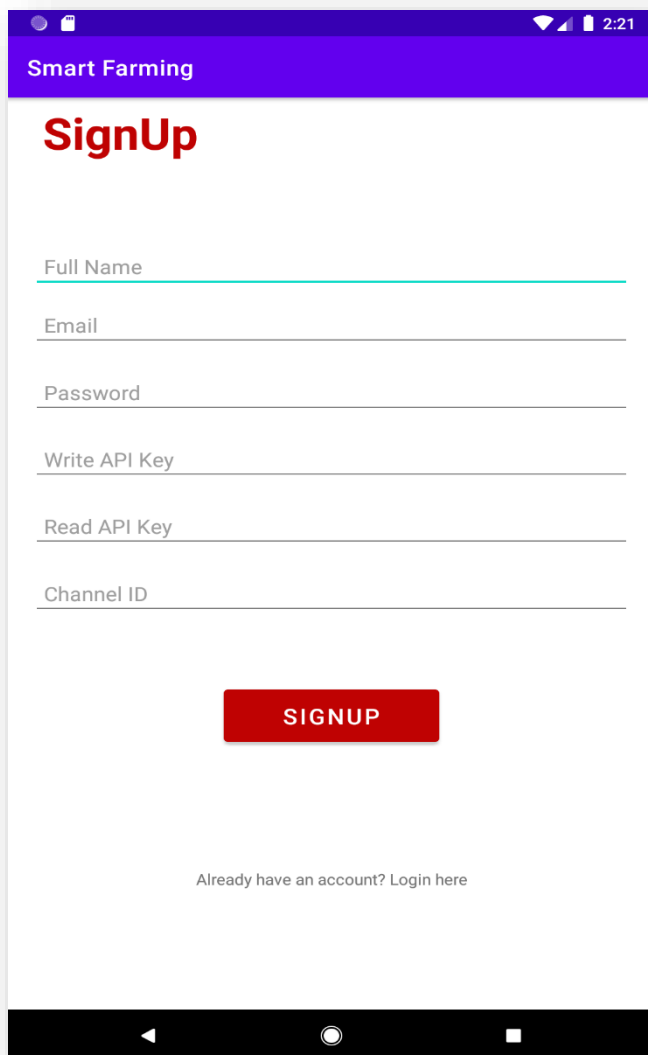
Blog | Documentation | Tutorials | Terms | Privacy Policy

- Go to api keys section
- API section has channel id, write api key, read api keys.
- These keys are used to modify any field values
- Write api – to write value to a field
- Read api – to read value from a field
- These keys are later used to create an account in smart farming android app

5.ANDROID APP

- Smart farming app has been developed/created using android studio and uses **firebase** database to store user login information.
- It retrieves data from thingspeak cloud, which contains temperature and humidity data updated by sensor.
- As it retrieves data via internet, user can retrieve the data from anywhere.

SIGN UP



Smart Farming

SignUp

Full Name

Email

Password

Write API Key

Read API Key

Channel ID

SIGNUP

Already have an account? Login here

- User required to fill all the fields provided in the sign-up page
 - Name, email, password, write API key, read API key, channel id
 - User need to verify their email by clicking the link sent to their email
 - Fill the API keys obtained from thingspeak and click sign-up
 - All the information provided will be stored in firebase
 - Then it will take the user to the login page.

FIREBASE

Smart Farming ▾ Go to docs

Authentication

Users Sign-in method Templates Usage

✦ Prototype and test end-to-end with the Local Emulator Suite, now with Firebase Authentication [Get started](#)

Search by email address, phone number or user UID [Add user](#) [Refresh](#) [More](#)

Identifier	Providers	Created	Signed in	User UID ↑
jagac553@gmail.com	📧	2 Apr 2021	2 Apr 2021	8FYkX1jyRdTMMj0AoJDhN1cotPI2
hello@gmail.com	📧	30 Mar 2021	1 Apr 2021	B7mf6je3z5Vk02EaCRNrTczLWB1
sky.s0k0y5@gmail.com	📧	7 Apr 2021	29 Apr 2021	JEZkKhTSxlQTpAmqN976gPMnp2...
hello@world.com	📧	31 Mar 2021	2 Apr 2021	PI5f0cKEUZseDrJtzdJBnF78KK2
test1@gmail.com	📧	31 Mar 2021	31 Mar 2021	UAbsRjN1MfdW1ZXHTEM02uCTe...
jagac553@gmail.com	📧	30 Mar 2021	3 Apr 2021	VTxh1QmwAZSN1QrOwmGmK1p...
test2@gmail.com	📧	31 Mar 2021	31 Mar 2021	WrvNt9UL3Ab36WVlgeLqCtwWrmf1
test3@gmail.com	📧	31 Mar 2021	31 Mar 2021	cryYRKVQ7cfY5wckIsIVMtLtkGo2

<https://console.firebase.google.com/u/0/project/smart-farming-2fa83/authentication/users>

Smart Farming ▾ Go to docs

Realtime Database

Data Rules Backups Usage

✦ Prototype and test end-to-end with the Local Emulator Suite, now with Firebase Authentication [Get started](#)

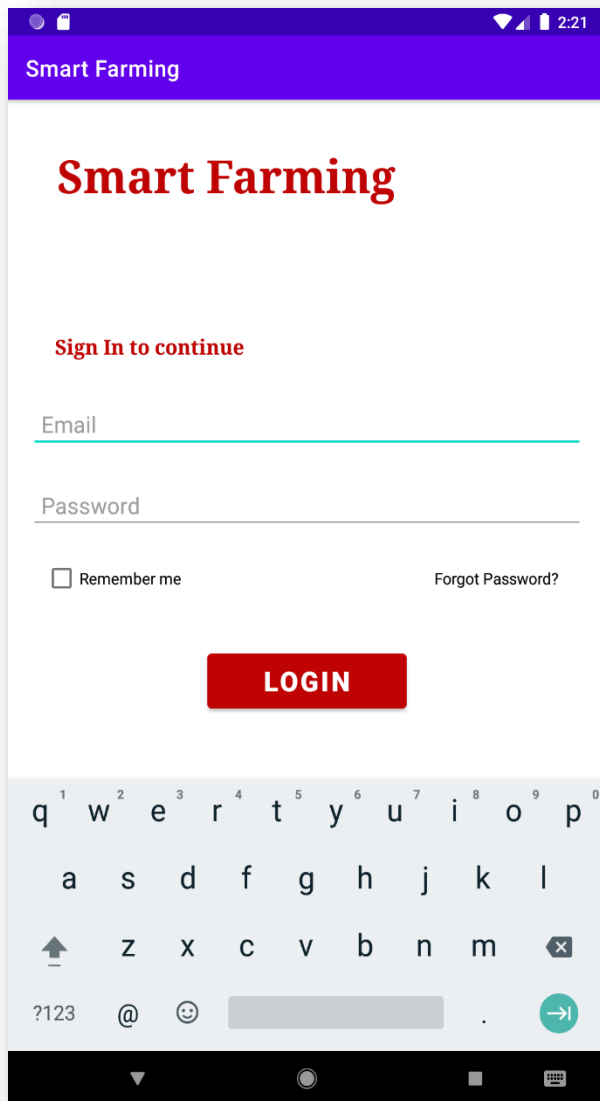
<https://smart-farming-2fa83-default-rtdb.firebaseio.com/>

smart-farming-2fa83-default-rtdb

- Users
 - 8FYkX1jyRdTMMj0AoJDhN1cotPI2
 - channelId: "123456789"
 - email: "jagac553@gmail.com"
 - fullName: "Sky"
 - password: "1234567"
 - readAPIkey: "hello google world"
 - writeAPIkey: "hello google hello"
 - B7mf6je3z5Vk02EaCRNrTczLWB1
 - email: "hello@gmail.com"
 - fullName: "Jagadeesh"
 - password: "1234567"
 - readAPIkey: "6MX5HCi6T5EDHHK\
 - writeAPIkey: "6F899VX89102VW"

- Firebase is a platform developed by Google for creating mobile and web applications.
- Firebase provides up to 1GB Storage for free on Firestore, the latest Google realtime database. After exhausting the free storage, users will pay for storage space and database operations
- User details stored in firebase.

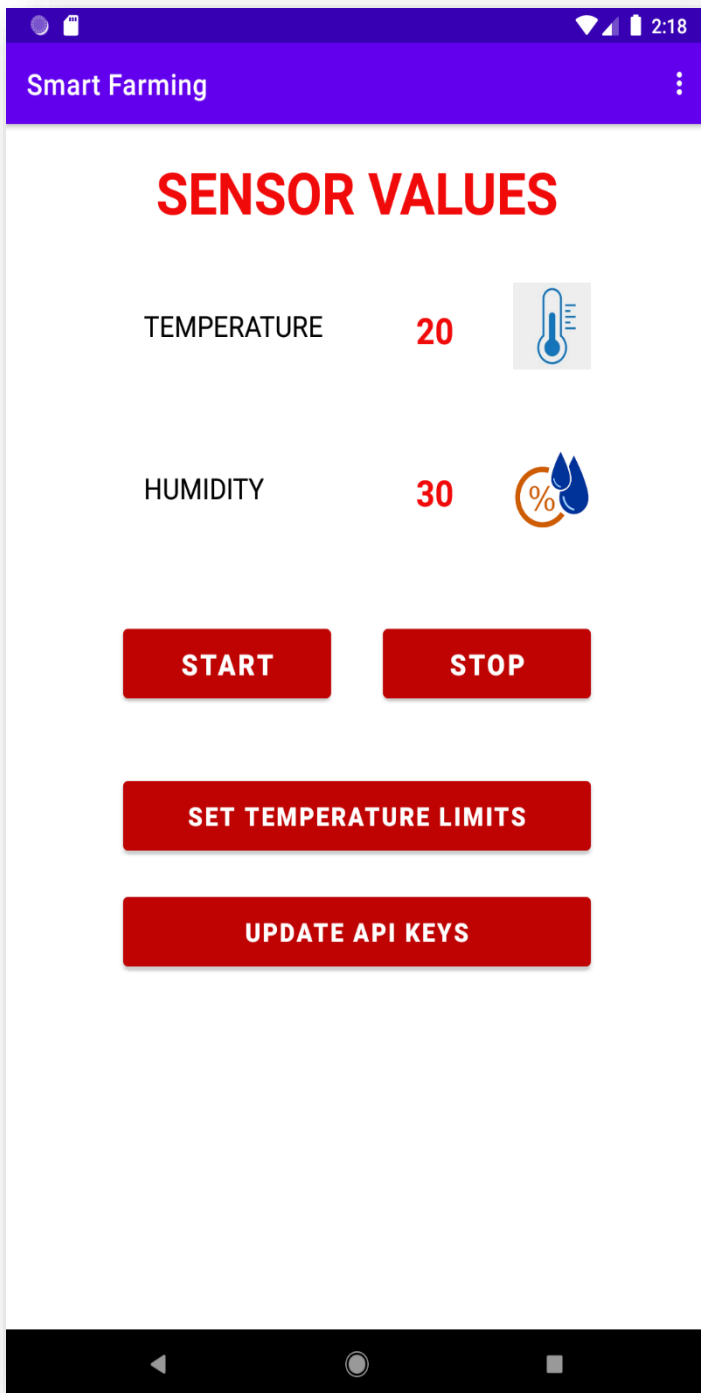
LOGIN



The image shows a mobile application interface for 'Smart Farming'. At the top is a purple header with the text 'Smart Farming'. Below the header, the title 'Smart Farming' is displayed in a large, bold, red serif font. Underneath the title, the text 'Sign In to continue' is shown in a smaller red font. There are two input fields: 'Email' and 'Password', both with light blue borders. Below the 'Email' field is a checkbox labeled 'Remember me' and a link labeled 'Forgot Password?'. A prominent red button with the word 'LOGIN' in white capital letters is centered below the input fields. At the bottom of the screen, a virtual keyboard is visible, showing letters, numbers, and symbols. The status bar at the very top shows the time as 2:21 and various icons for signal, battery, and notifications.

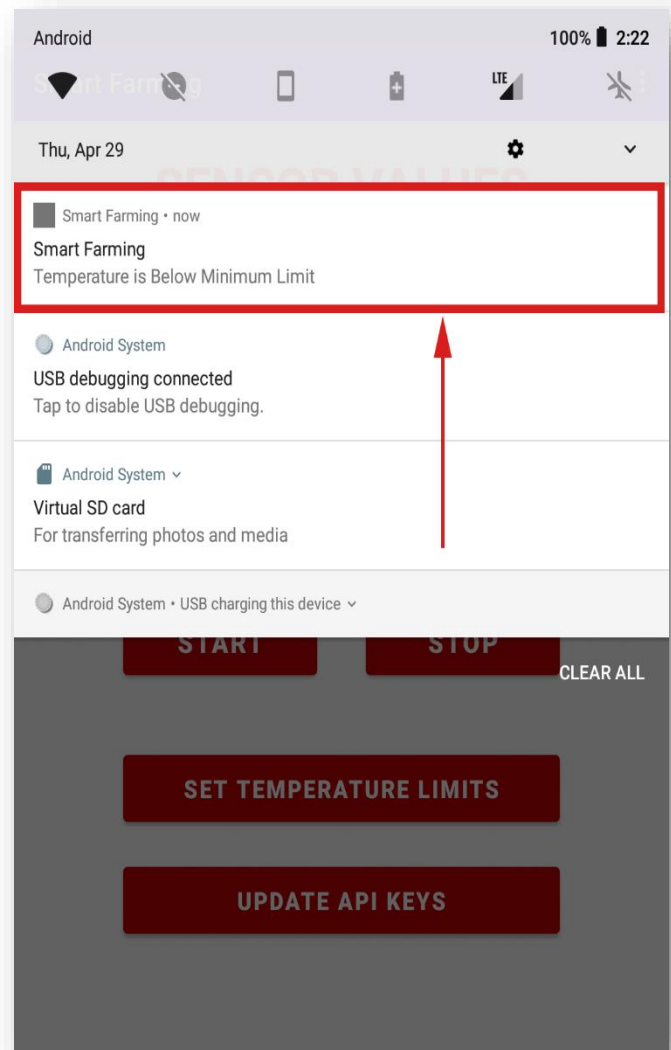
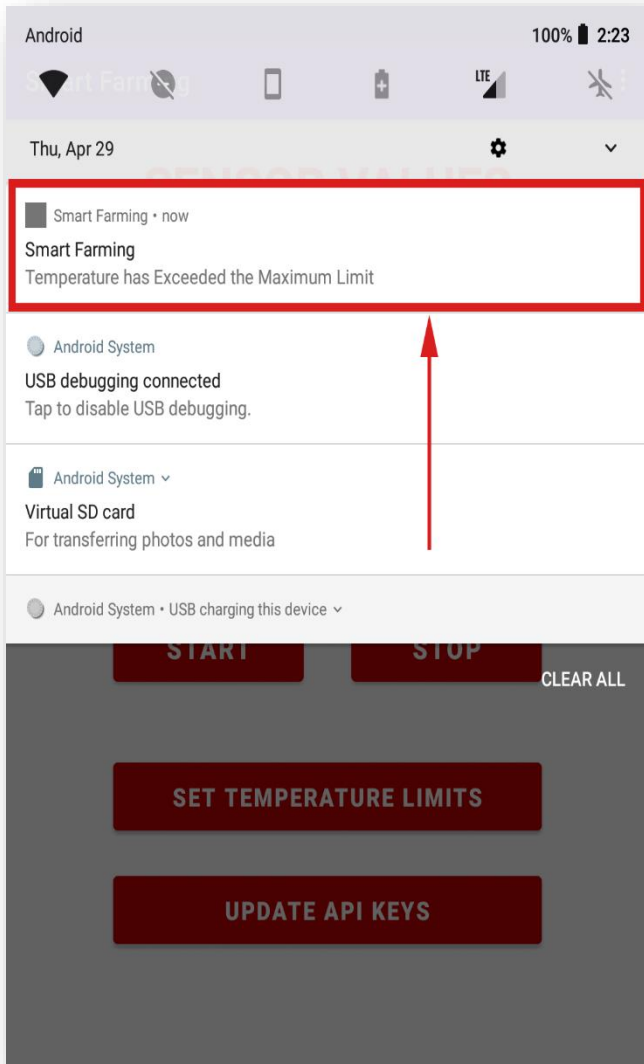
- User need to provide their email and password used while creating the account
- Email need to verified in order to login
- In case, If the user forgot their password, they can reset the password using “forgot option”, which sends an email to reset their password
- remember option used to remember the user.
- If the credentials provided are correct then the user will taken to the home page.

HOME PAGE



- Home page displays the temperature and humidity values
- App will start reading the temperature and humidity data continuously from thingspeak field1 and 2, once the user clicks start button
- And the app will stop when the user clicks stop button
- Set temperature limits and update api keys buttons will take the user to their respective pages
- User can logout using the logout button present in menu at upper right corner in the home page

NOTIFICATIONS.



- User will be notified by notification if the temperature limit goes below minimum temperature limit or beyond maximum temperature limit.

TEMPERATURE LIMITS

The image shows a mobile application interface for "Smart Farming". At the top, there is a purple header bar with the text "Smart Farming". Below this, the section "CURRENT TEMP LIMITS:" is displayed in red. Underneath, the current settings are shown: "MIN TEMP : 18" and "MAX TEMP : 35". Below these, there are two input fields. The first field contains the number "18" and is underlined. The second field contains the number "35" and is also underlined. Below the input fields is a red button with the text "UPDATE" in white. Below the button, the status is displayed as "STATUS: Updated Succesfully". At the bottom of the screen, there is a numeric keypad with digits 1 through 9, a comma, a zero, a period, and a green checkmark button. The top of the screen shows a status bar with icons for signal, battery, and time (2:20).

Smart Farming

CURRENT TEMP LIMITS:

MIN TEMP : 18

MAX TEMP : 35

18

35

UPDATE

STATUS: Updated Succesfully

1 2 3 -

4 5 6 _

7 8 9 ✕

, 0 . ✓

- User can set the maximum and minimum temperature limit by clicking “set temperature limits” button in home page which takes user to the page shown in the image
- Minimum and maximum limit is updated in thingspeak field3 and 4.

API keys.

The image shows a mobile application interface for 'Smart Farming'. At the top, there's a purple header with the app name. Below it, a section titled 'CURRENT API KEYS:' displays three values: CHANNEL ID (1344908), WRITE API KEY (62FJS1CM2EG2RG62), and READ API KEY (N8PITW237YADMYW8). Below this, there's a section titled 'UPDATE API KEYS' with three input fields for CHANNEL ID, WRITE API KEY, and READ API KEY. Each field has a red 'UPDATE' button next to it. At the bottom, there's a numeric keypad with digits 1-9, 0, a decimal point, a comma, and a green arrow button.

Smart Farming

CURRENT API KEYS:

CHANNEL ID: 1344908

WRITE API KEY: 62FJS1CM2EG2RG62

READ API KEY: N8PITW237YADMYW8

UPDATE API KEYS

CHANNEL ID

UPDATE

WRITE API KEY

UPDATE

READ API KEY

UPDATE

1 2 3 -

4 5 6 _

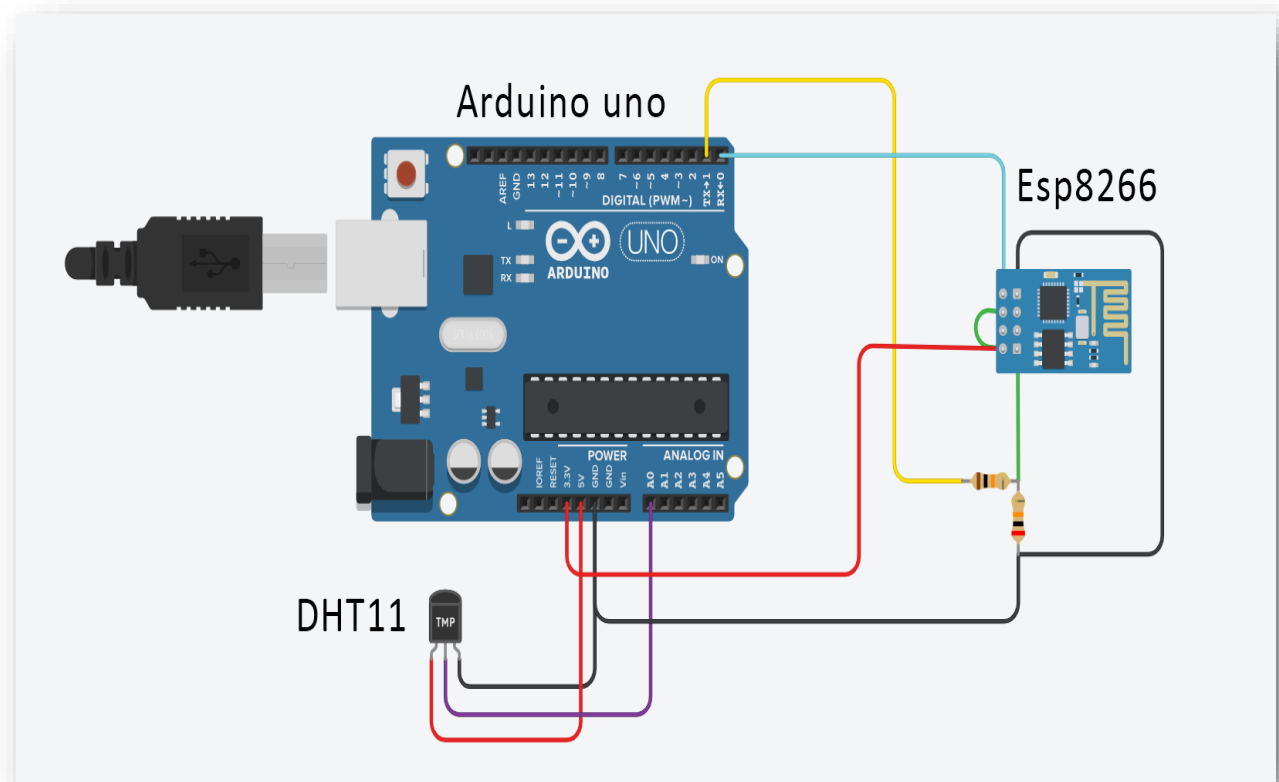
7 8 9 ✕

, 0 . →

- User can also update the API keys by clicking “update API keys” button in home page which takes user to the page shown in the image
- Here user can update the channel id, write API key, read API key.

CIRCUIT DIAGRAM . (online simulator)

Online simulator: Tinkercad



- Esp8266 works on 3.3v, 5v will burn the module.

6.CONCLUSION

An automated control system of a Smart Greenhouse uses a network of sensors to monitor. Our Smart Greenhouse solution will enable growers to monitor their parameters that are crucial for healthy growth of the crop, and send notification on their device.

ADVANTAGES:

1. Control environment for better yield.
2. Save power, electricity and water consumption.

We are mainly focusing on three parameters, those are as follows.

1. Temperature within the house.
2. Humidity within the house.

An automated control system of a Smart Greenhouse uses a network of sensors to monitor and measure the run-off. The insights gathered are used to measure energy consumption which in turn helps growers to use the resources optimally.

Our Smart Greenhouse solution will enable growers to monitor their parameters that are crucial for healthy growth of the crop, send alerts when there's a problem. This will further help them with the following strategic benefits enhancing their horticultural practices:

1. Monitoring parameters for anomaly.
2. Control environment for better yield.
3. Save Power and electricity.

7.REFERENCES

1. <https://www.mouser.com/datasheet/2/758/DHT11-Technical-Data-Sheet-Translated-Version-1143054.pdf>.
2. <https://www.tinkercad.com/learn/circuits>
3. <https://www.halvorsen.blog/documents/technology/iot/thingspeak/resources/ThingSpeak.pdf>

8.ACKNOWLEDGMENT.

We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Signature with date)

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