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UNIVERSITY OF LIBERAL ARTS
BANGLADESH

CSE 499

One Semester Long Project

**Green Source: Development of an UAV Driven Autonomous Seed Plantations
and Monitoring System**

Submitted By

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Green Source: Development of an UAV Driven Autonomous Seed Plantations and Monitoring System

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Project report submitted
in partial fulfillment of the requirements
for the degree of
Bachelor of Science in Computer Science and Engineering

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DECLARATION

I am capable of understanding the plagiarism policy of the university and acknowledge that " Green Source: Development of an UAV Driven Autonomous Seed Plantations and Monitoring System," is particularly a product of my final year CSE 499 One Semester Long Project, the research study during this development is completely my own, except for where indicated by reference, we declare that this work has not been submitted for any other degree or professional qualification except as stated. The data presented in this paper was obtained in experiments carried out by us after and during development of an UAV Driven Autonomous Seed Plantations and Monitoring System

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CERTIFICATE OF APPROVAL

The project entitled “Green Source: Development of an UAV Driven Autonomous Seed Plantations and Monitoring System” is submitted to the Department of Computer Science and Engineering at University of Liberal Arts Bangladesh (ULAB) in partial fulfillment of the requirements for the degree of Bachelor of Science.

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Abstract

Bangladesh is predominantly an agriculture country where agriculture sector plays a vital role in accelerating the economic growth. The production rate of agriculture is so high. But till now they are not using much technologies for seed plantation and monitoring systems. I came up with a solution called UAV driven autonomous seed plantation and monitoring system. We are now in a pandemic situation. In this situation, we use a UAV for seed plantation. Different types of UAVs are available. UAV has some amazing features. These are used for a different purposes. So that I focused on the agriculture part. In this part, my drone works automatically and through some seed in the field. After thronging the seed drone send latitude and longitude and altitude to the web portal. So that people can see the real-time data which get from a drone. Also, store this data to this web portal so that after growing the tree they have to track where they through seed ball. This project aims to help the farmer. Farmer can visualization their field situation without going field. Also, add some features which are not available in existing software.

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Chapter 1

Introduction

Tree plantation is very much important for Bangladesh. Because we faced various types of natural disasters so can for protecting our country we need some plantations. Also, our 14.2% GDP depends on this farming procedure and 42.7% of people are depending on this employments. [1] The performance of this sector is an overwhelming impact on macroeconomic developments. But till now that much technological work is not done yet in this field. So that I came up with a solution that is related to that field. I use a UAV (Unmanned Aerial Vehicle) for seed plantation and monitoring the whole system in a web portal. In the existing software are not that many free features, so that I want to implement some features which are impacting our agriculture and also impact the growth of GDP. We are now in a pandemic situation in this situation if all the farmers are work in the field so that affection increase to day by day. Which is very alarming for our society also our country.

Taking all that situation into consideration my project aims to develop a solution which is easier to use farmer. Also, a farmer can't go into the field they can be monitoring these using these UAVs. Farmers can use this UAV in various kinds of works. Like Seed Plantation, Monitoring the tree growth, use this drone for spread spray. According to WHO (World Health Organization), it is estimated that around 3 million workers are affected every year by poisoning. So I think about this matter also the pandemic situation. Because if farmers use my solution so that they can't go outside. If they are go for operating UAV so that one land one farmer can enough. So that farmers can maintain all kinds of social distancing. I already told about there are some UAV operating existing software but in this software has some limitation can be addressed. This report aims to demonstrate a descriptive study on the methodologies, aims, and objectives and result in analysis studied of this using UAV for autonomous seed plantation and monitoring system. I want to call

this project “Green Source – Development of an UAV Driven Autonomous Seed Plantation and Monitoring System”

1.1 Aims and Objective

According to Global Forest Watch and World Research Institute (WRI), more than 3,22,000 acres of forest land have eroded in Bangladesh for the last 7 years.[2] which is two times of the Mymensingh Division. For that reason, my aim and objective are to plant some trees and try to help a farmer in this pandemic situation with a technological solution. With this consideration in I using hardware and web portal solutions. My hardware a UAV these are the carry seed ball and fly from the ground station and throwing seed ball to the field also send data to the web portal. Drone master and farmer both can see this data which send from the ground by UAV.

1.2 Motivation and Contribution

When starting this project I saw some data which is Bangladesh has 15% of the Landmass designated as a forest where an estimated 25% area of any country should be covered with trees. Which is very alarming for our nature. After that when I started my one semester-long project I discuss it with my supervisor. After a detailed discussion sir show me some challenges in this project. Which is very difficult for to me find a solution. After knowing these challenges I motivate myself to work for nature. When I started contributing my project I face some difficulties and challenges. My first challenge is to find a UAV autonomous procedure. I completed this. My drone is flying automatically with an 800gm load. My second challenge is to send automatically send data to my web portal. Firstly I try to find UAV autonomous existing software API. But I can't find any API. All software's

are so much restricted. So that I try to create my system. After that successfully done this. Also, UAVs can send data properly. That is my motivation and contribution.

1.3 Best Selling Features and Uniqueness

“Green Source” is my project where I use some features. Which are some of the features are available in the existing solution. But I create it my way so that I have some uniqueness. These unique features are given below:

- A. Custom-made UAV: In the market, there are lots of UAVs. But when I complete my research I can't find any proper UAV which is aligned to my project. So that I will go for Custom made UAV. Because I need better payloads to carry option. So that my UAV carries approximately 800gm weight at a time in a flying mood.
- B. Duel Fly mood: In this UAV which is Octa-Copter has a duel flying mood. Drone Master can fly manually and if he wants he can also fly an autonomous mood. This autonomous mood drone can select a ground station for this drone after that he select a route for this drone. Then drone can fly automatically and complete the work and back to the ground station.
- C. Location Tracking: For autonomous, I need to drone location tracking. That's the reason I use a GPS module in my drone. For that reason, drone masters can find easily drone locations.

- D. Automatic Data Send: My UAV is connected to my computer so that UAV continues to send real-time data when they work in the field. Drone masters and farmers can be monitoring this data from the web portal. So that without go outside people can easily track their field situation.
- E. Data Stored: In my web portal UAV's data is stored automatically for future work. Because after complete the plantation drone master or farmer can fly the drone again so that they have another data collect from the field which is tree growth. So that for future work purposes I stored all the data in the web portal. Also, it helps to company documentation.
- F. FPV Camera Setup: In my drone has an FPV camera setup. So that users can easily observe the whole situation in the field. This is another feature in my UAV.

Chapter 2

Methodology

In the previous chapter I already told about my project introduction. After getting the introduction you have already getting some knowledge about the project. In this chapter I would like to describe my project in a traditional way. I would like to describe my project methodology. In this methodology section I will describe clearly about my project and provide justification selecting each one. From the SDLC (Software Development Life Cycle) method we have try to concentrate some phase so that project will be worked in proper way.

From the SDLC method firstly we have a planning phase, secondly we have analysis phase, thirdly we have design phase, fourthly we have development phase, fifthly implementation phase, and finally testing phase. Now I will describe all the phase elaborately.

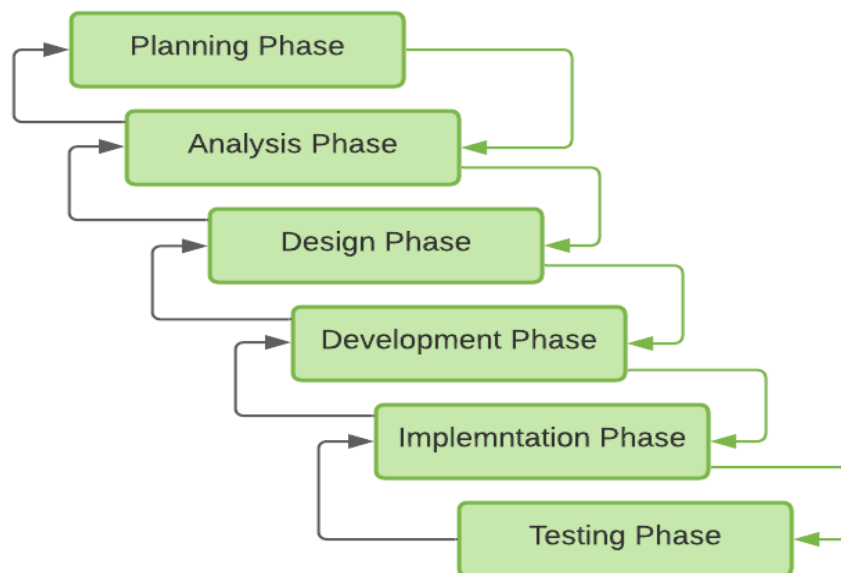


Figure 2.1: SDLC (System Development Life Cycle)

2.1 Planning Phase

This project is for CSE499 one semester long project. Before starting this project I considered present forest and farming situation in our country. I surprised that our country is developing country but still there is no much technological improvement in this field. After getting this point of view I planning to work on this project. I discussed about the matter with my supervisor he was also agreed with me and after that we started our analysis phase of this project.

2.2 Analysis Phase

In this phase I was analysis about some existing product which already used all over the world including our country. But there is some limitation and challenges so that I can overcome this limitation. I discuss about my supervisor then analysis that best selling features of our project. And analysis that why our web and desktop app different from others. So that this all about analysis part.

2.3 Design Phase

In this phase firstly I design my UAV. Then I work on the traditional way. Which is system are design by block diagram, Use case scenario, flow diagram, data flow diagram entity relationship of this system. After completing by design part I move on to the development phase.

2.4 Development Phase

In this phase I working on my proposed solution. In this phase firstly I working on my UAV. After completed my first flight I started working on desktop app and web portal. In this development phase my 1st challenge is UAV are guided to autonomous mood. 2nd challenges is send drone data to the web portal. After getting different types of resources I s to done this challenges properly.

2.5 Implementation Phase

In this phase I implemented my proposed model and completed my challenges. UAV is working automatically and send data to the web portal automatically.

2.6 Testing Phase

For testing purpose I use my UAV for autonomous flying and send data to the web portal.

Chapter 3

Literature Review

In Chapter 2 I already discuss my project methodology. Now chapter 3, I discuss about some existing UAV and some drone autonomous software. So that we can find the limitations. Because there is lots of UAV company are available. But for my project I can't find any proper UAV company who made a agriculture drone properly. That's the reason I going for the Custom Made UAV.

3.1 Why Custom-made UAV

In the market lots of UAV companies are available. Like DJI [12], Yuneec [13], Uvify [14], etc. They are making drones their way. For that reason, they are work in specific features. I need that kind of drone which helps our agriculture field. For that reason after completing my survey and discussion with my supervisor, I will go for a custom-made drone.

When I starting study DJI drones (Figure 3.1.1) then I findings that DJI works on commercial drone making for photography and videography purposes [15]. So if I go in this product so I have some complications. Because I need an agriculture drone which sends me data of seed plantation. So that I can't go DJI drone.



Figure 3.1.1: DJI Mavic Mini Drone

Also, I study about another manufacturing company which is Uvify [14]. They are making drones for a light show in the sky (Figure 3.1.2). So that they do not match my requirements also.



Figure 3.1.2: Uvify Draco

After completing these I decided to make a custom-made drone for my project with some features. Which is need for my project.

Now I want to discuss some existing software which makes for drone autonomous purpose. In Bangladesh lots of work done in different applications like hospital emergency supply [5], Supporting disaster and crisis management [6], etc. In this work, they used max time one software which is APM (Ardu Pilot Mission Planner). Outside the country also have lots of research is done. They also used this APM. APM is a very popular software for UAV management systems [7]. So that without any further thinking people can easily rely on this Ardu Pilot Mission Planner software.

I saw another app which is DJI Pilot [8]. People also use this app for UAV's autonomous and manual flying purposes. That is not open-source. This apps is only for

DJI products [9]. For example DJI Phantom, DJI Mavic Pro/Mini, etc. Any kind of DJI product we can operate in this apps/software. So that for custom-made UAVs people can't use DJI Pilot apps. But I also studied about this software. What kind of facility they are provided in their system. I saw that they have some simple features which are manual flying mood, auto flying mood, video recording. In the auto-piloting mood, you can select a route then after connected your DJI device, this will follow that route.

To simplify all kinds of considerations the developer of the Ardu pilot released this mission planner software in August 2010 [10]. After that, they are updating this software day by day. Now it is in stable condition. Still have a huge opportunity to update this. Mission Planner has two versions one is for desktop version and one is android version. Another app DJI Pilot released on 29 October 2018. Which is 8 years difference between the two apps/software. Now I show you some screenshots of these two software/apps.

3.2 Ardu Pilot Mission Planner (APM)

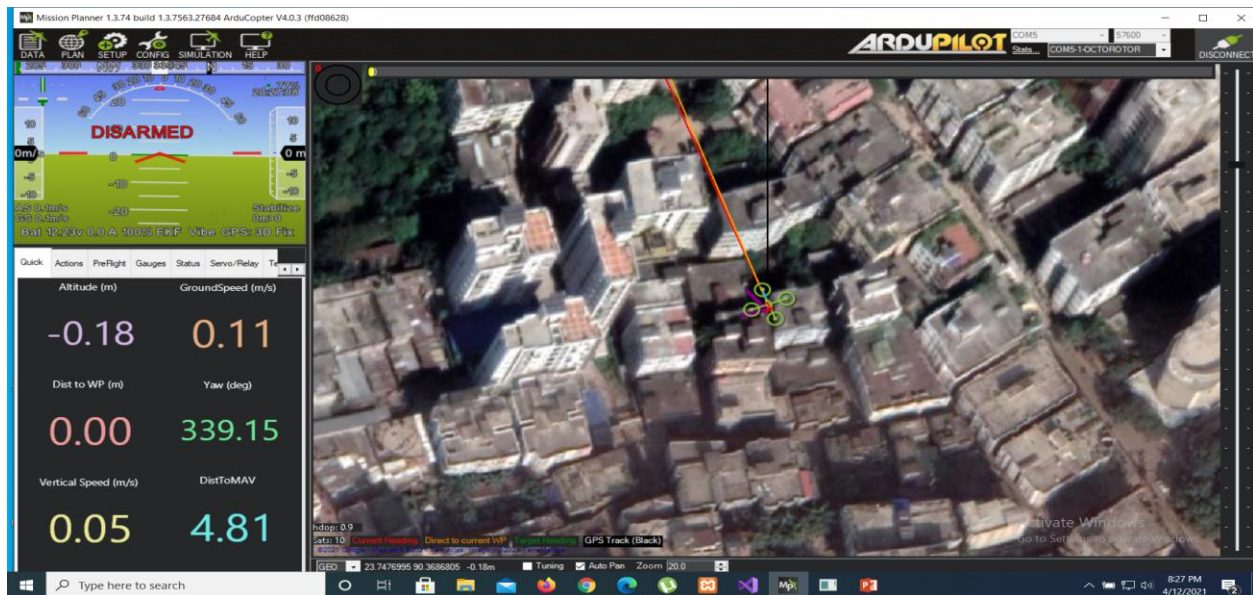


Figure 3.2.1: Ardu Pilot Mission Planner Disarmed Mood (Desktop View)

In this APM software when I opened this is the 1st interface of this software. After connecting my UAV to this software this stays in a Disarmed mood (Figure 3.2.1). So that I can see altitude, Ground Speed, Yaw, etc. Also, I see the location of my UAV. So that we can see in this disarmed mood altitude is -0.18m. This means UAVs are not preparing for flight. But there is some limitation. We can't store this data. This is real-time data and it's shown only once. Which is the limitation of this software.

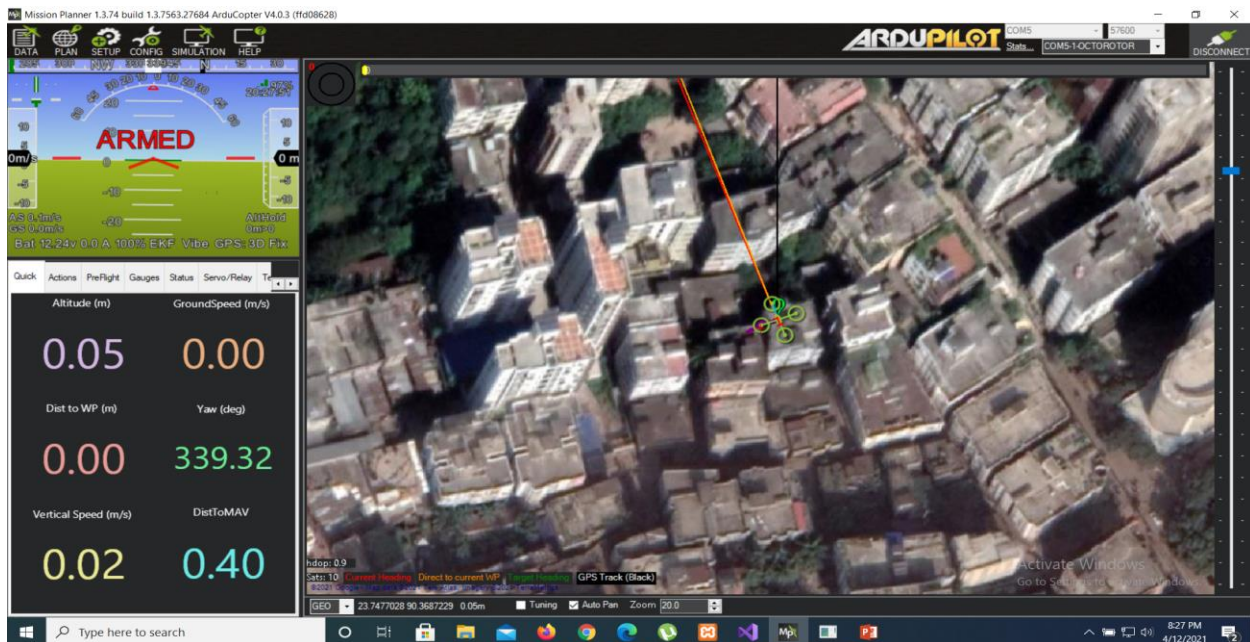


Figure 3.2.2: Ardu Pilot Mission Planner Armed Mood (Desktop View)

And now this is the armed mood view of this desktop version (Figure 3.2.2). Armed mood means your vehicle is ready to take off. And we saw that there is the altitude which is in the plus mood. That is 0.05m. After takeoff of your flight, this will be increased.

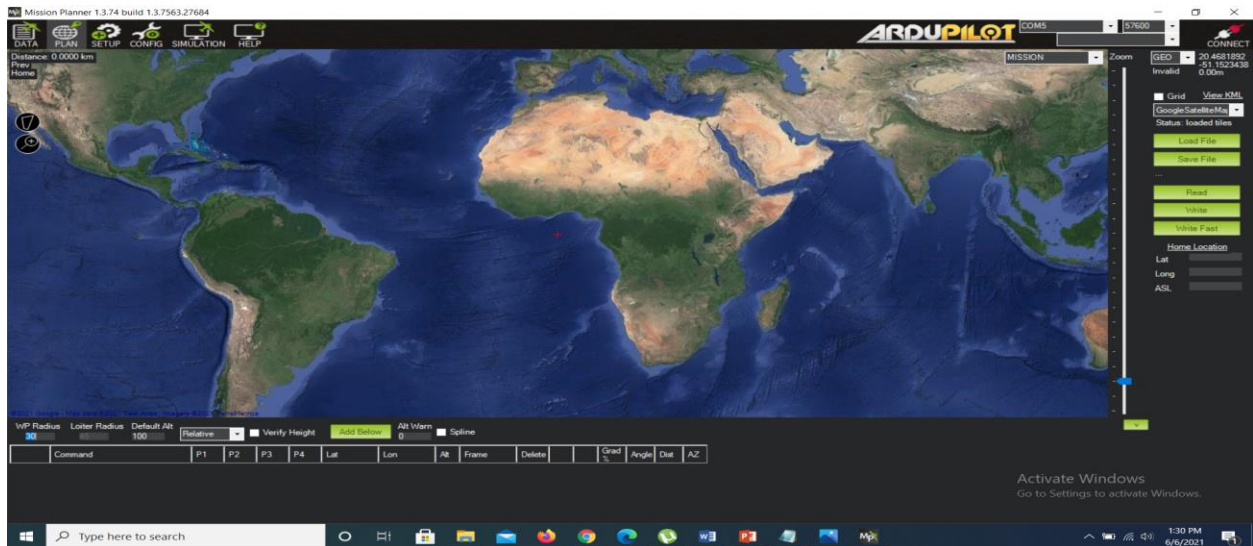


Figure 3.2.3: Ardu Pilot Mission Planner Plan Setup and Mapping For Autonomous Flight

In this interface, we can set a plan for our autonomous flight mood (Figure 3.2.3). We can select a ground station. Also, we select which route can be followed. And set mapping also you can set the altitude, ground speed, and reverse route. But the thing is this only for once. So that in my project I can't use it properly in this software.



Figure 3.2.4: Ardu Pilot Mission Planner Plan (Android View)

There is no difference between desktop view and android view (Figure 2.1.4). We can be followed by the same procedure for take-off and landing.

That is all about the ARDU Pilot Mission Planner Apps and Software.

3.3 DJI Pilot

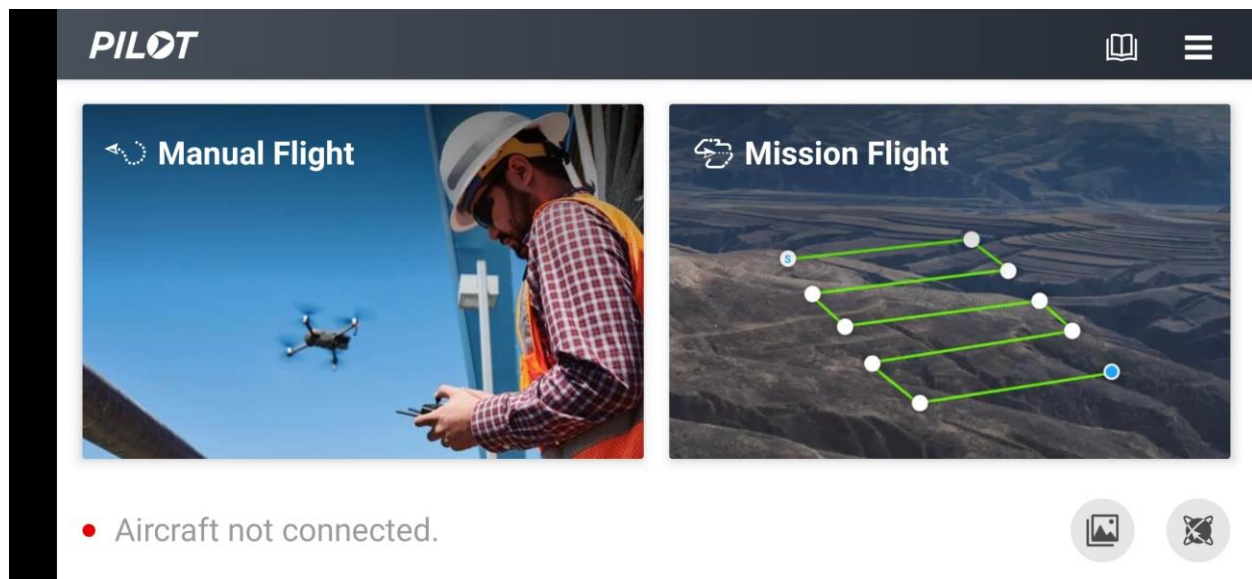


Figure 3.3.1: DJI Pilot Home Interface (Android View)

This is the DJI Pilot apps interface (Figure 3.3.1). There is a dual fly mood option. One is manual fly mood and the next one is mission flight.

The target of these two features is you fly your DJI drone by using a remote. When you are fly by remote you can record a video with this drone. Also, capture pictures. This is the manual Mood works.

Another one is Mission Flight. This feature aims to set a plan for automatic flight. You can set a route also a ground station. So that UAV can arm its way. After that take-off and landing, it can be followed this routes.

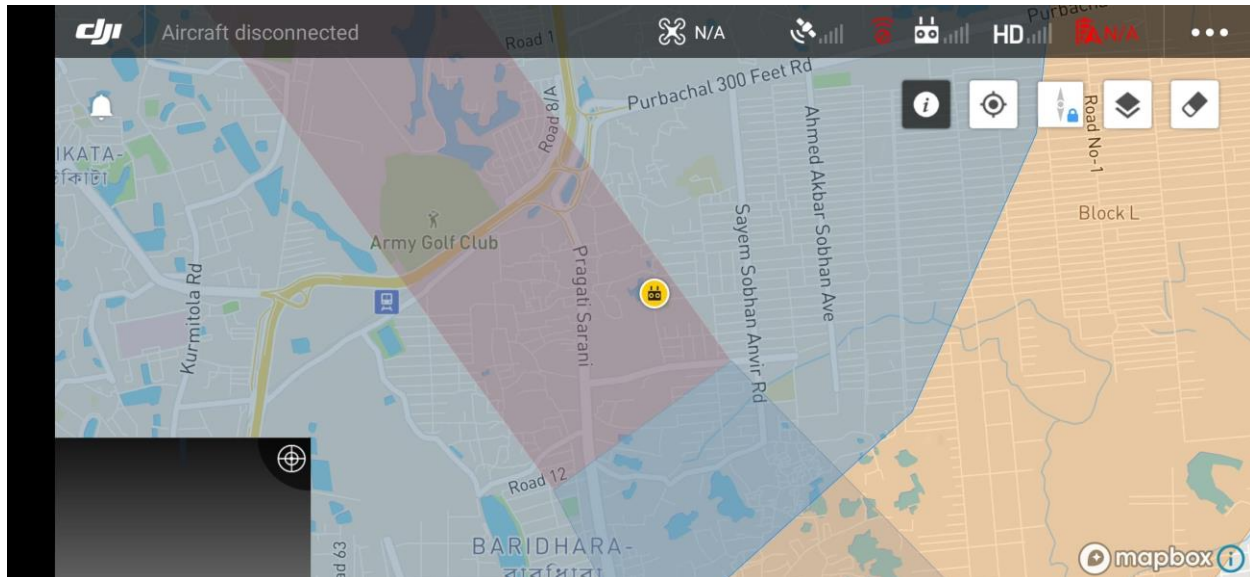


Figure 3.3.2: DJI Pilot Manual Flight Interface (Android View)

When I entered manual flight this is the interface (Figure 2.3.2). If I have a DJI drone I can connect easily to these apps. So that I can find my drone and make a video from the sky.

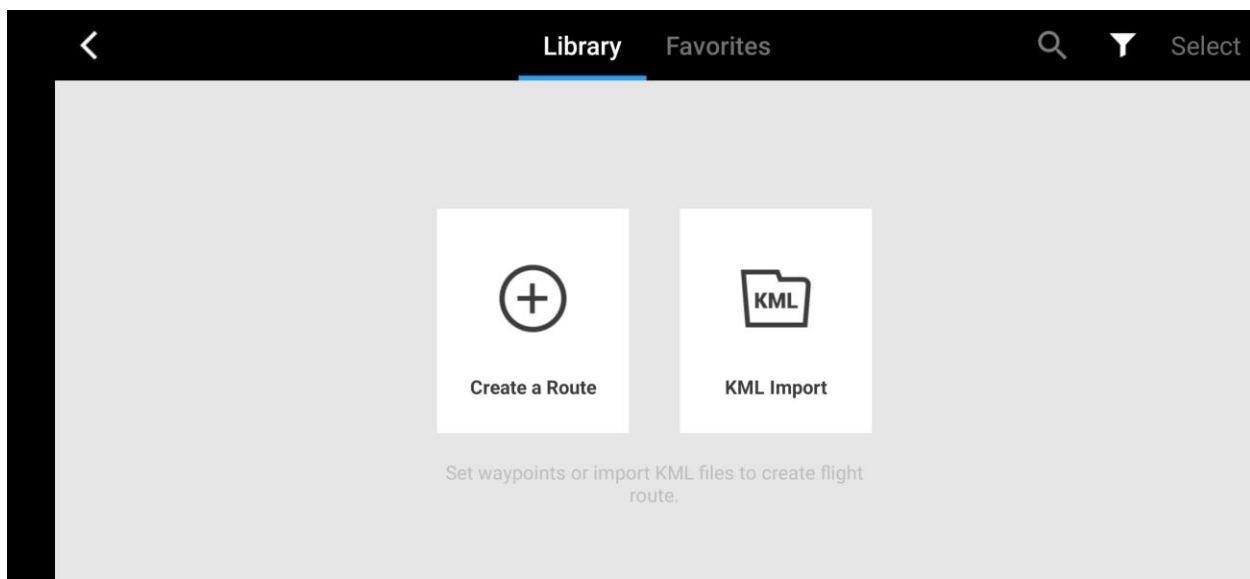


Figure 3.3.3: DJI Pilot Mission Flight Interface (Android View)

After entering the mission flight I can see these two options (Figure 3.3.3). Which is Create a Route and KML Import. KML is a file that is Keyhole Markup Language [11]. In these features, I can import a KML file so that the flight can be auto-armed. Also, we can create a route. Which is mapping and select route for the drone.

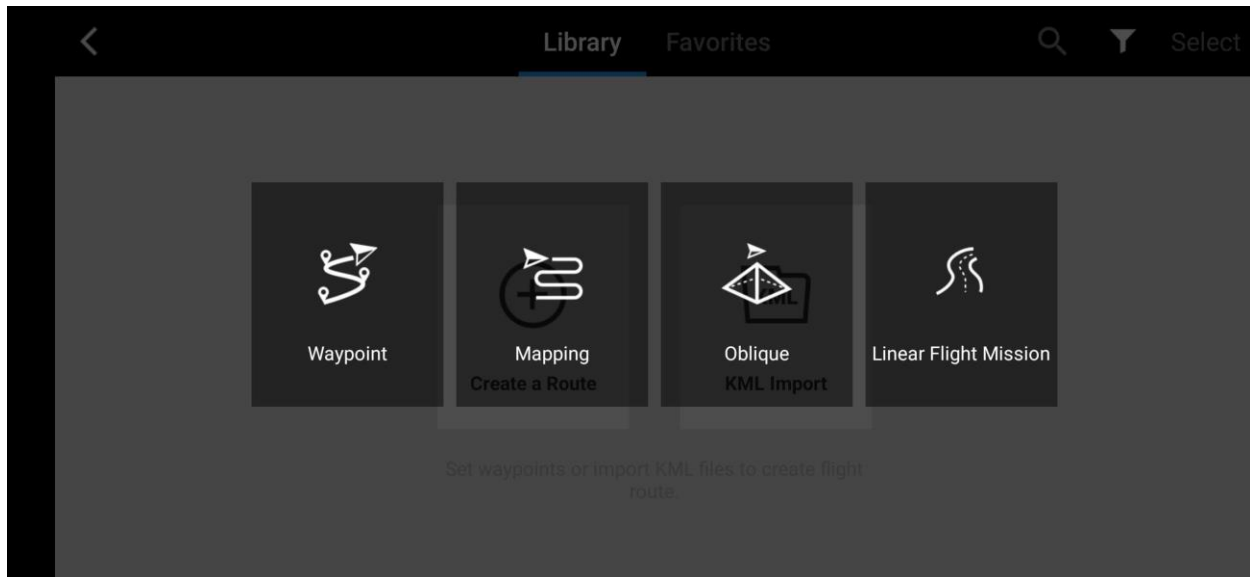


Figure 3.3.4: DJI Pilot Mission Flight Interface (Android View)

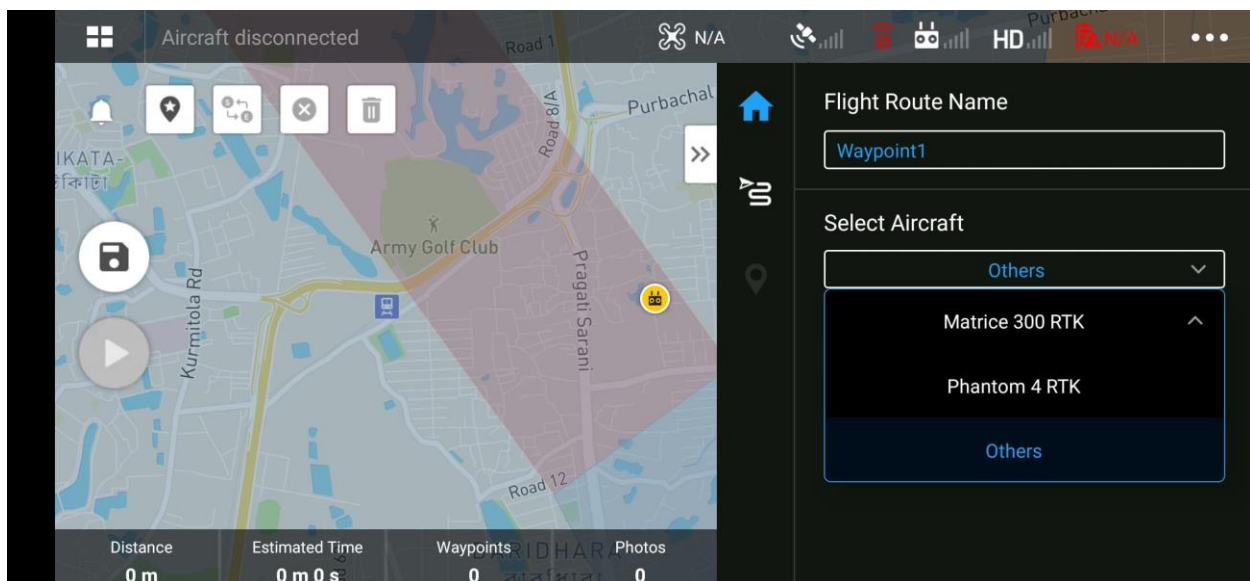


Figure 3.3.5: DJI Pilot Mission Flight Aircraft Selection Interface (Android View)

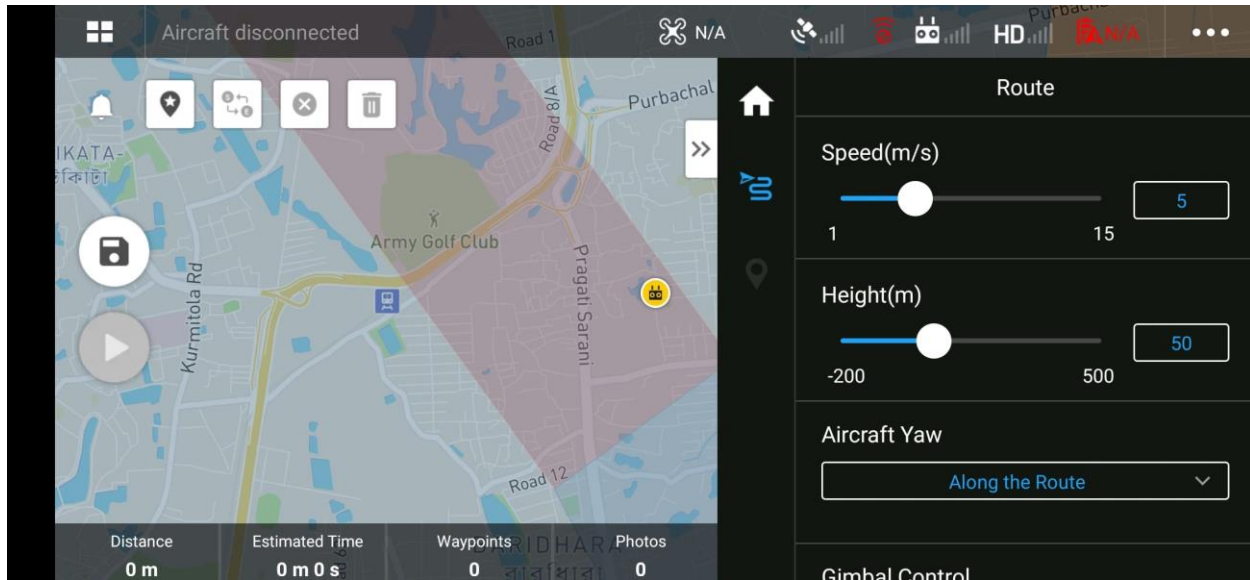


Figure 3.3.6: DJI Pilot Mission Flight Route Selection Interface (Android View)

In that figure, I showed you how mission flights are work. Firstly you can select one from Figure 3.3.4. I choose waypoint. After that, these apps ask me which kind of aircraft I used for my flight (Figure 3.3.5). After Selection the aircraft I can choose a route. In this section, I have to select speed, height, Aircraft Yaw, etc (Figure 3.3.6). So that after complete the selection this UAV is ready to take off. But this feature only for DJI Drone. Not only others drone.

3.4 Some Limitation

Some limitation I identified in those software's. Limitation are given below

- I. Mission Planner is open source I can connect custom-made drones but they can't provide an API for storing data. They provide only real-time data. Which is the limitation.
- II. DJI is not open source. If you are using DJI drone so that you can use this software also access, This store video, and capture photo but only using DJI drone.

Chapter 4

Design and Development of the Proposed System

In the previous chapter, we know about some software features and some hardware features which is related to UAV's autonomous system. Also, I find some limitations of this existing software. Which are related to my project. Now in chapter 4, I discuss my project specification. I already told you about my project. My project is using a UAV autonomous seed plantation and a monitoring system. For that reason, I need Hardware and Software both.

For my project, I selected a UAV which is Octa-Copter. In this copter, I use a custom-made octa frame also used brushless DC motor. I use a flight control board. Then I use 3 cell lipo battery. For manual flying mood, I use transmitter and receiver. And for the auto flying mood, I use the FPV Telemetry module. Also, I use a box which is carried payloads in the drone.

Listed are specification of this hardware

- Drone Master (Admin) present in the field with this Octa-Copter
- Add payloads in the drone with a seed ball
- Drone master (Admin) can fly this aircraft manually or automatically
- After getting decision aircraft is ready to take off
- After taking off aircraft through some seed ball in the field
- Send data to the web portal
- After completing work aircraft back into the ground station

Set of some requirements of this hardware to achieve this specification

- Custom-made Octa copter frame
- 8 Brushless DC Motor
- 8 ESC (Electronic Speed Controller)
- 1 Flight Control Board (Pixhawk)
- 3S Lipo Battery (1 Pair)
- FPV Telemetry Module (Ground and Air Module)
- Transmitter and Receiver
- GPS
- Payloads Box

4.1 Hardware Requirements Details

Already I told you about my aircraft specification and requirements. Now I told about the requirements whole details.

4.1.1 Custom-made Octa Copter Frame

In this frame, I use a carbon fiber pipe. This frame length is 58 inches. This frame is equal on both sides. This frame height is approximately 10 inches.

4.1.2 Brushless DC Motor



Figure 4.1.2.1: DJI 2212/920 KV Brushless DC Motor

I use a DJI 2212/920Kv brushless DC motor (Figure 4.1.2.1). In this motor specification, I saw DJI recommended load is 300gm/axis. Also, the recommended battery is a 3S Lipo Battery. This motor stator size is 22×12 mm and RPM is 920 rpm/v. And the motor weight is 50gm [16]. I use 4 pairs of this motor.

4.1.3 ESC Electronic Speed Controller

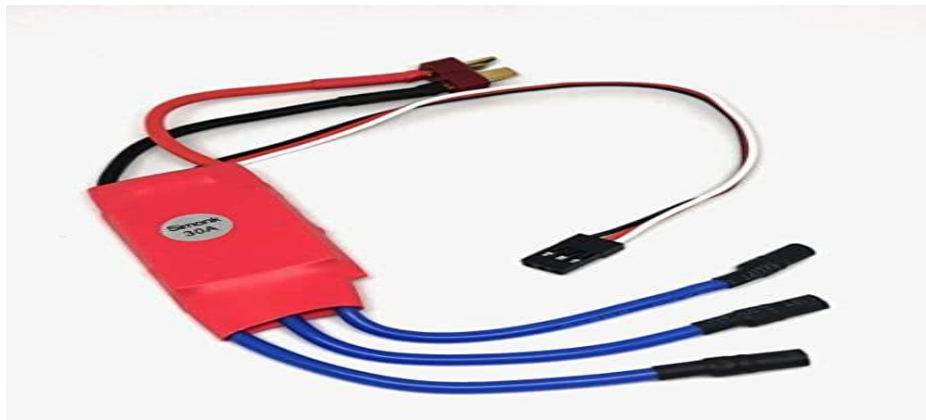


Figure 4.1.3.2: ESC (Electronic Speed Controller)

Electronic speed controller called ESC (Figure 4.1.3.2). It works for controlling motor power. On the DJI site, they are recommended ESC for particular this motor. I can't find the exact one. But try to find the same category ESC. After I used that ESC also 4 pair.

4.1.4 Flight Control Board (Pixhawk)



Figure 4.1.4.4: Pixhawk (Flight Control Board)

Pixhawk a flight control board that is used in aircraft. On this board, we have lots of options. We can add all motors connection, GPS connection, telemetry connection, and also receiver connection to this board. This is an aircraft brain also. All commands from the drone master is going to this board after that board can be decided how aircraft fly in the sky.

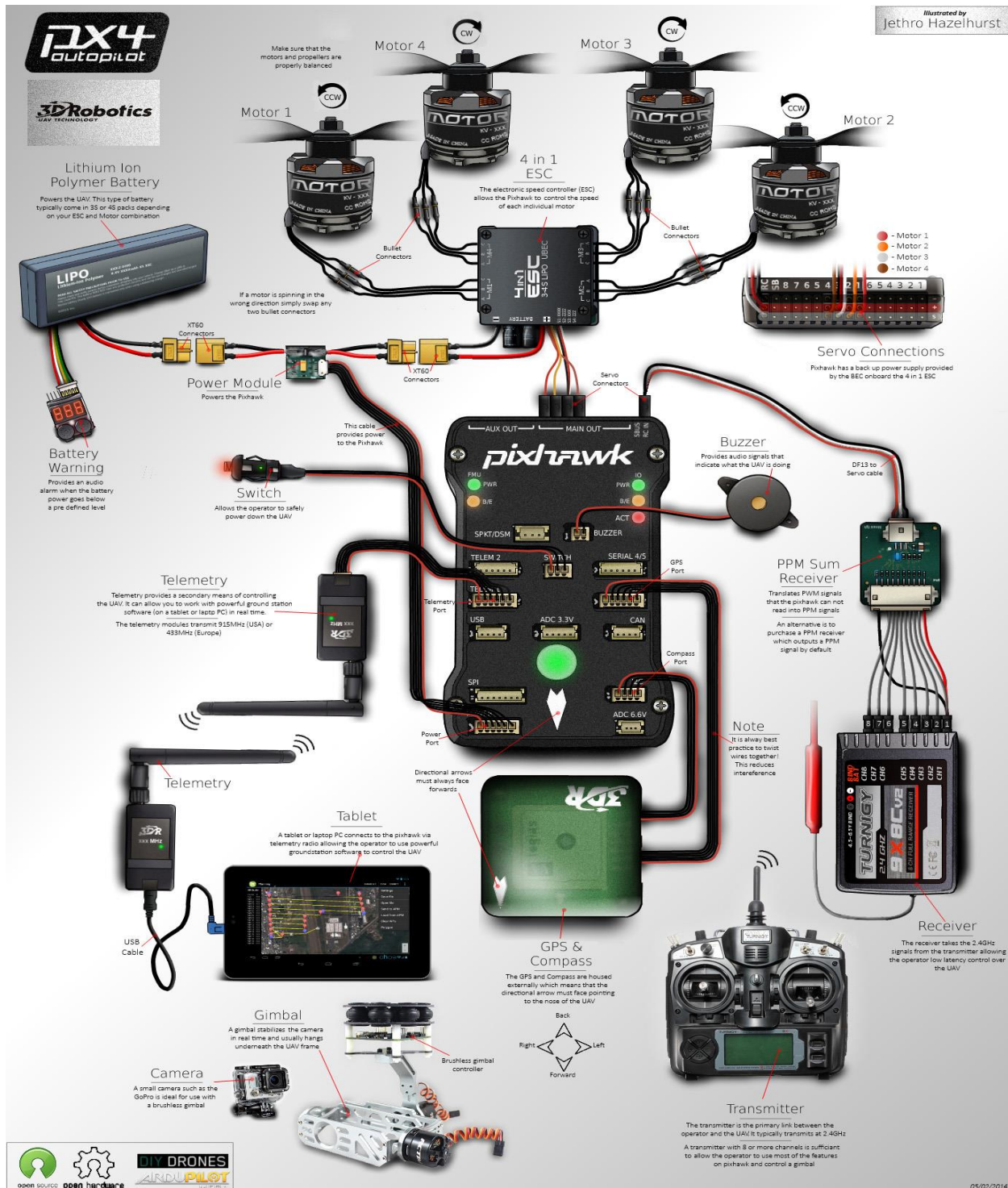
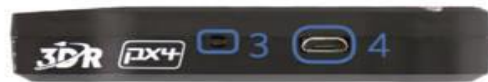
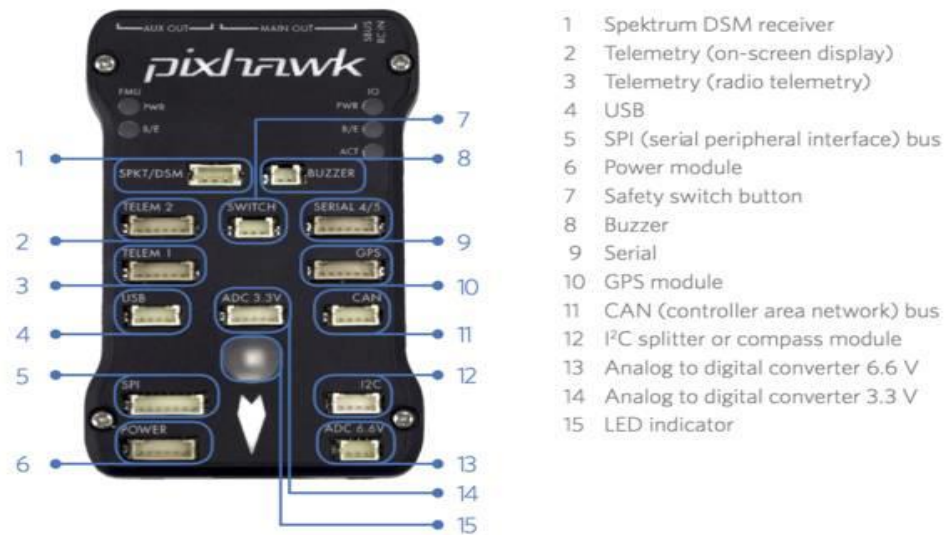


Figure 4.1.4.5: Pixhawk Connection Diagram

We saw the pixhawk assemble procedure (Figure 4.1.4.5). This is documentation which is a get from the px4 site [17]. Pixhawk specification are given below [18]

- Processor
 - 32-bit ARM Cortex M4 core with FPU
 - 168 Mhz/256 KB RAM/2 MB Flash
 - 32-bit failsafe co-processor
- Sensors
 - MPU6000 as main accel and gyro
 - ST Micro 16-bit gyroscope
 - ST Micro 14-bit accelerometer/compass (magnetometer)
 - MEAS barometer
- Power
 - Ideal diode controller with automatic failover
 - Servo rail high-power (7 V) and high-current ready
 - All peripheral outputs over-current protected, all inputs ESD protected
- Interfaces
 - 5x UART serial ports, 1 high-power capable, 2 with HW flow control
 - Spektrum DSM/DSM2/DSM-X Satellite input
 - Futaba S.BUS input (output not yet implemented)
 - PPM sum signal
 - RSSI (PWM or voltage) input
 - I2C, SPI, 2x CAN, USB
 - 3.3V and 6.6V ADC inputs
- Dimensions
 - Weight 38 g (1.3 oz)
 - Width 50 mm (2.0")
 - Height 15.5 mm (.6")
 - Length 81.5 mm (3.2")



- 1 Input/output reset button
- 2 SD card
- 3 Flight management reset button
- 4 Micro-USB port

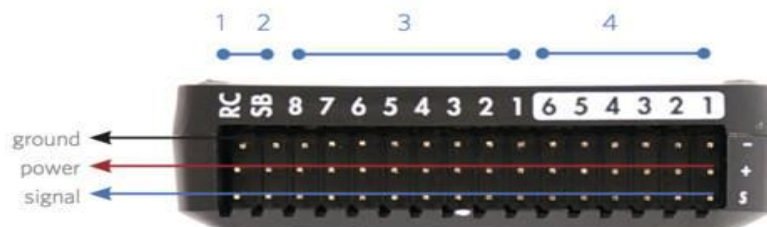


Figure 4.1.4.6: Pixhawk Pin Diagram

In the figure 4.1.4.6 we saw that all the pin are work for different purpose. So that there is many features for that reason I choose that one

4.1.5 3S Lipo Battery



Figure 4.1.5.7: 3S Lipo Battery

I use 1 pair 3S lipo battery for flying purpose. This battery give me 20/25 minutes battery backup for first time flight in full charge.

4.1.6 FPV Telemetry Module



Figure 4.1.6.8: Radio Telemetry

This module works basically for drone autonomous purpose. There are two modules: one is the ground module which is connected to the PC, and the other is the air module which is connected to the aircraft. After building a connection, the aircraft will fly automatically.

4.1.7 Transmitter and Receiver



Figure 4.1.7.9 Transmitter and Receiver

Here I used FS-i6 transmitter and receiver which is used for manual fly purpose. Since I already told that in this aircraft dual flying mood. So for manual flying purpose I used this transmitter and receiver.

4.1.8 GPS



Figure 4.1.8.10 GPS

I used a GPS in this aircraft for tracking location when aircraft flying automatically. Also this GPS send me real time location so that aircraft movement also find easily.

4.1.9 Payloads Box

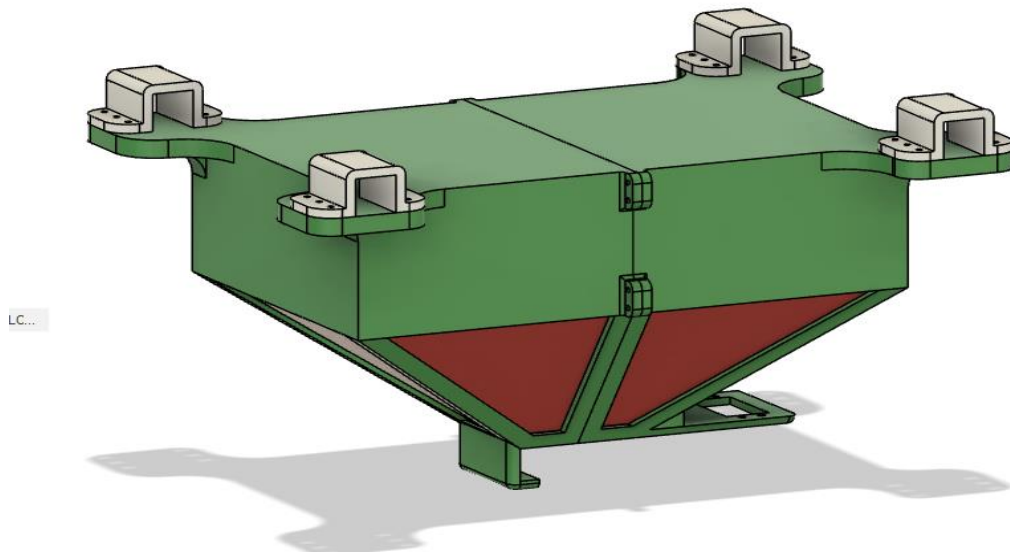


Figure 4.1.9.11: Payloads Box

This payloads box design for carrying seed ball in the drone. Aircraft can fly with this box. After flying aircraft through seed ball in the field. So this is the payloads box (Figure 4.1.9.11)

This all about hardware details now move on to the web part.

4.2 Web Portal and Desktop App Details

Already I told that this project another feature is monitoring data. So that I have a desktop app for sending drone data to the web. Also, I have a web portal to store data for further analysis. In my web portal has three users one is Super Admin, the second one is Admin, the third one is the client. Super admin has all power to add admin see all data remove anyone etc. Admin drone master. He operates the drone in the field and gets data and sends it to the web portal. And finally client. The client is a farmer or landowner who is thinking about plant some trees in his field. The client hires an admin from the green source. Admin can operate the drone in the field and send data to the web portal and client can see in his house without going field.

Now I listed are specification of this desktop app and web portal

- Super admin can add and remove admin, client.
- Super admin, admin and client can monitor all drone data
- Client can request to super admin for provide an admin to operate drone in his field
- Super Admin can approved request and assigned nearest admin to operate drone
- Admin can operate drone with the help of desktop app so that drone fly autonomously.
- When admin operate this drone in the field drone send data to the web portal.

- Client can see all data from the green source web portal.
- Super Admin, Admin and client they three have specific account and they all have a unique ID.

Consideration with all the specification now I show you some design diagram. Which is help you to understand how system are works

4.2.1 Block Diagram

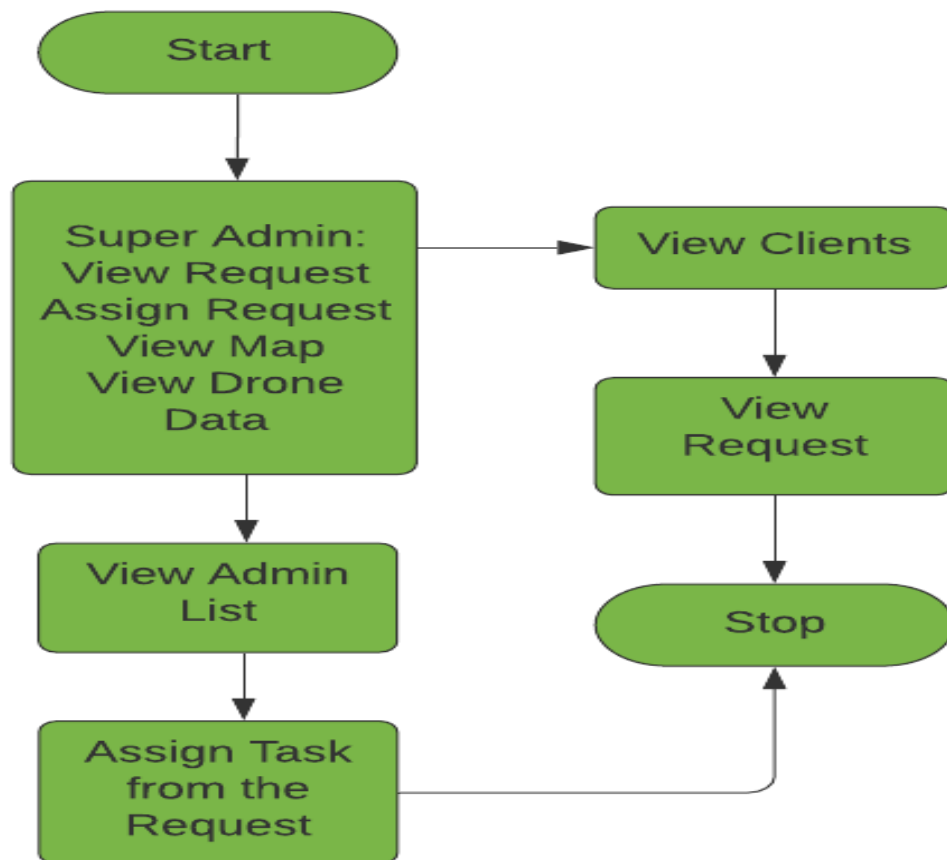


Figure 4.2.1.1: Block Diagram of Green Source (Web Portal)

A block diagram is a simplified of our system design. In this system main

components are super admin. Super admin can privilege to maintain admin, client and others necessary things. Super admin can view admin and assigned client request. Also super admin can view all client request for assigned nearest admin to work in the field. This is my system block diagram.

4.2.2 Flow Diagram

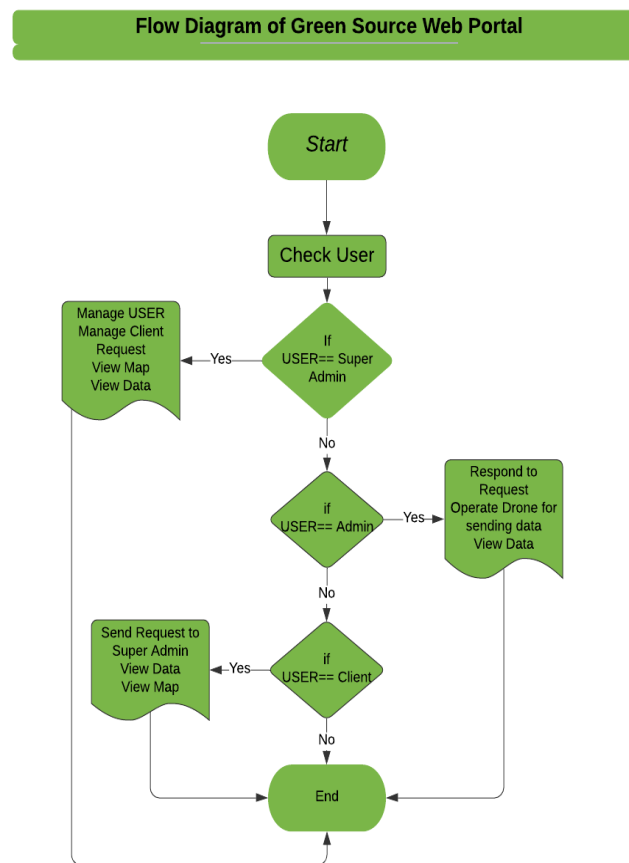


Figure 4.2.2.1: Flow Diagram of Green Source (Web Portal)

In this Diagram we saw that when the system starts system firstly check which user are login in the portal. If its super admin, then he/she can mange user, manage client request, view map and view data. After completing its end. If no then check for admin, if its yes then admin can respond to super admin request then operate the drone with the help of desktop app, sending data to the web portal, and view all data to the web. If its no then system check its client or not if yes then client can send request to the super admin for operate the drone in his field. Also he view all data and view map. After completing the work its ends. This is the flow of my system.

4.2.3 USE Case Diagram

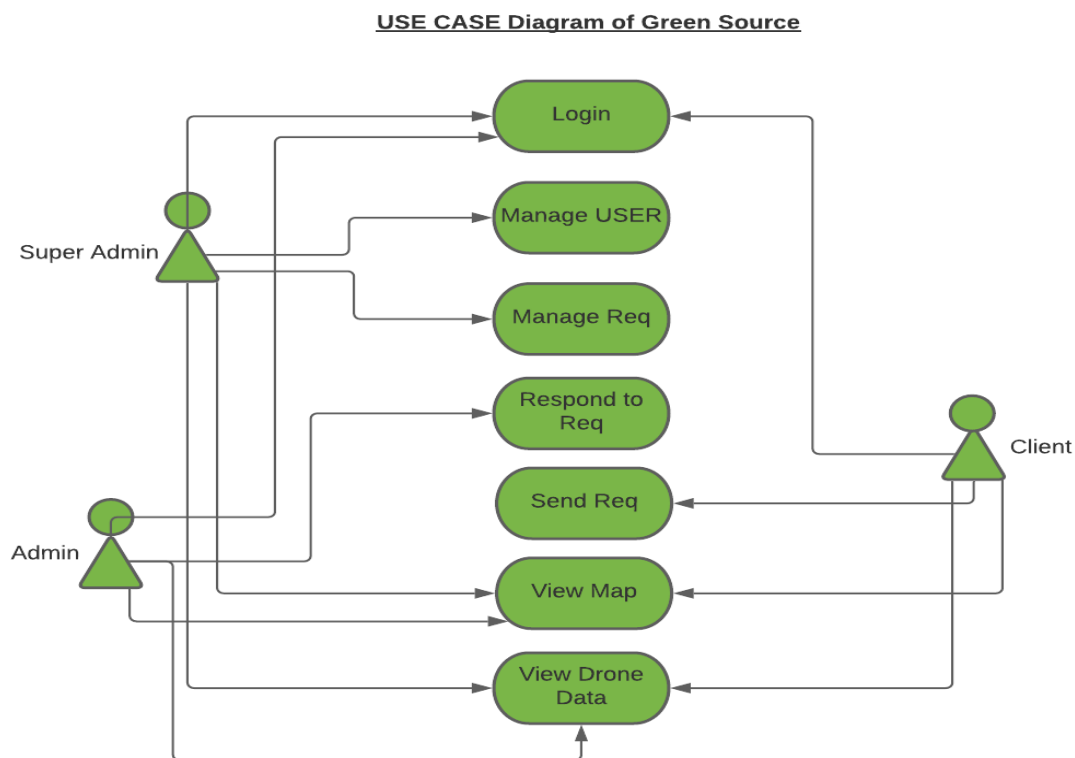


Figure 4.2.3.1: USE Case Diagram of Green Source (Web Portal)

In this use case diagram we saw that super admin can access login, manage user which is add remove and edit, Manage all request which is getting from the client, then super admin can view drone data and map. Admin can respond to the request which is assigned by super admin, also he can operate drone and send data to the web portal using green source desktop app. Also he can view drone data and map. Client can request to super admin for operating drone in his field. Also he can view drone data and map. Admin and client also login in this web portal.

4.2.4 DFD (Data Flow Diagram)

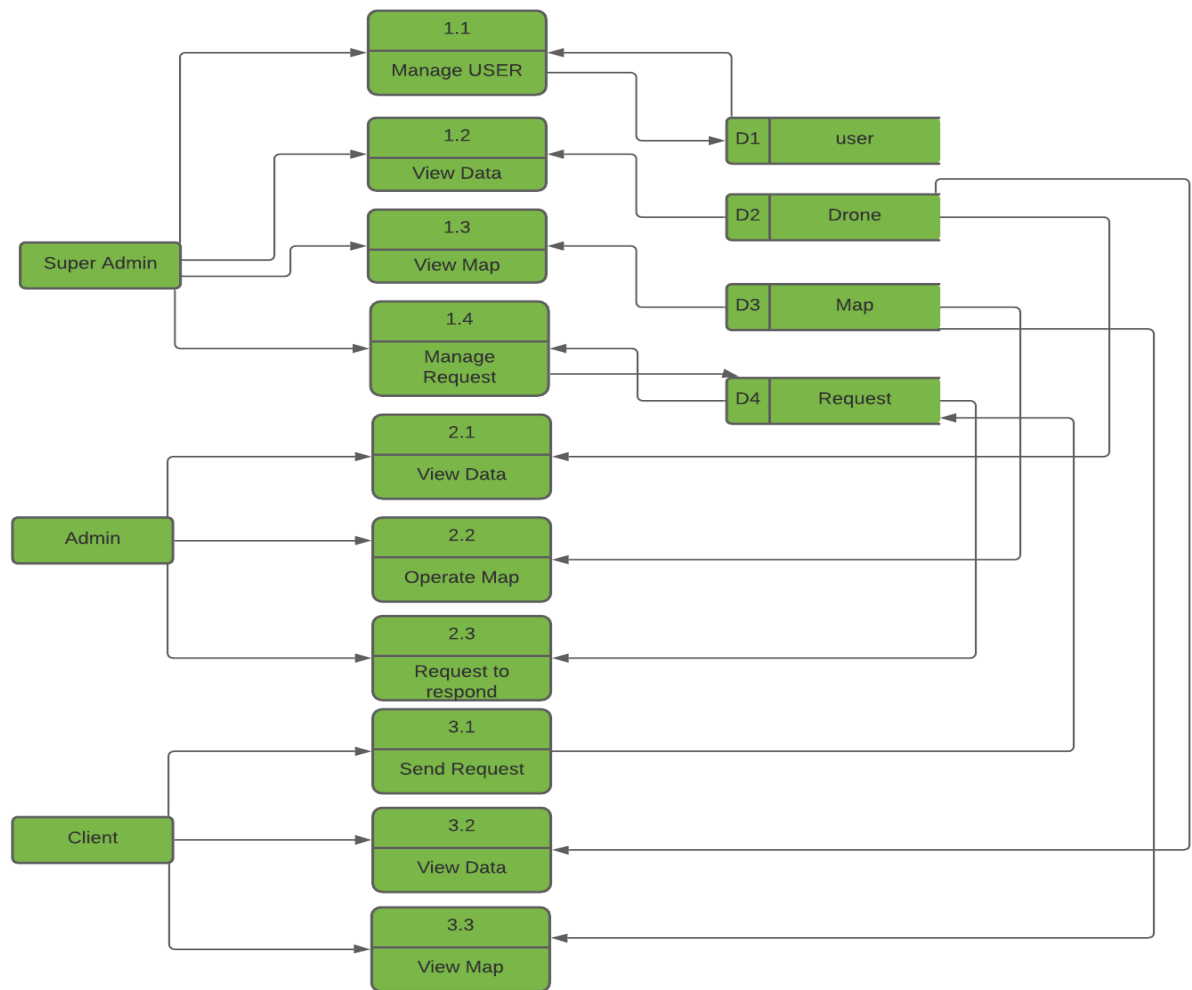


Figure 4.2.4.1: Data Flow Diagram (Web Portal)

DFD is Data Flow Diagram which is basically system inputs, outputs and data stored function in the system. I use this diagram to implement this system make easier. Visualizing each part makes it simple to define inefficiencies and create the best system possible.

In this diagram we can see super admin can manage user data which is input user data to the system. When super admin want to see data he can also view this data from the database. USER data stored in D1. Client can request for seed plantation in his fields and super admin can manage this request and admin can respond this request which data stored in D4. Super admin, admin and client all are view drone map and view drone data which get from the aircraft. Both data are stored in the D3 and D2. This is the data flow management in this system.

Set of some requirements of this web portal and desktop app to achieve this specification

- Server: Apache.
- Programming Language: PHP (Web Portal), Python (Desktop app), HTML, CSS, JavaScript.
- Framework: Laravel, Bootstrap.
- Python Package: DroneKit
- Database: XAMPP, MySQL.
- IDE: Visual Studio Code

So there is the primary specification and some requirements of my project.

Chapter 5

Result and Analysis

In the previous chapter I already talked about the design and development of this project. In this chapter I show you the result of the current system progress and some analysis. Firstly I describe about the hardware after that I show you the web portal.

5.1 Hardware Result

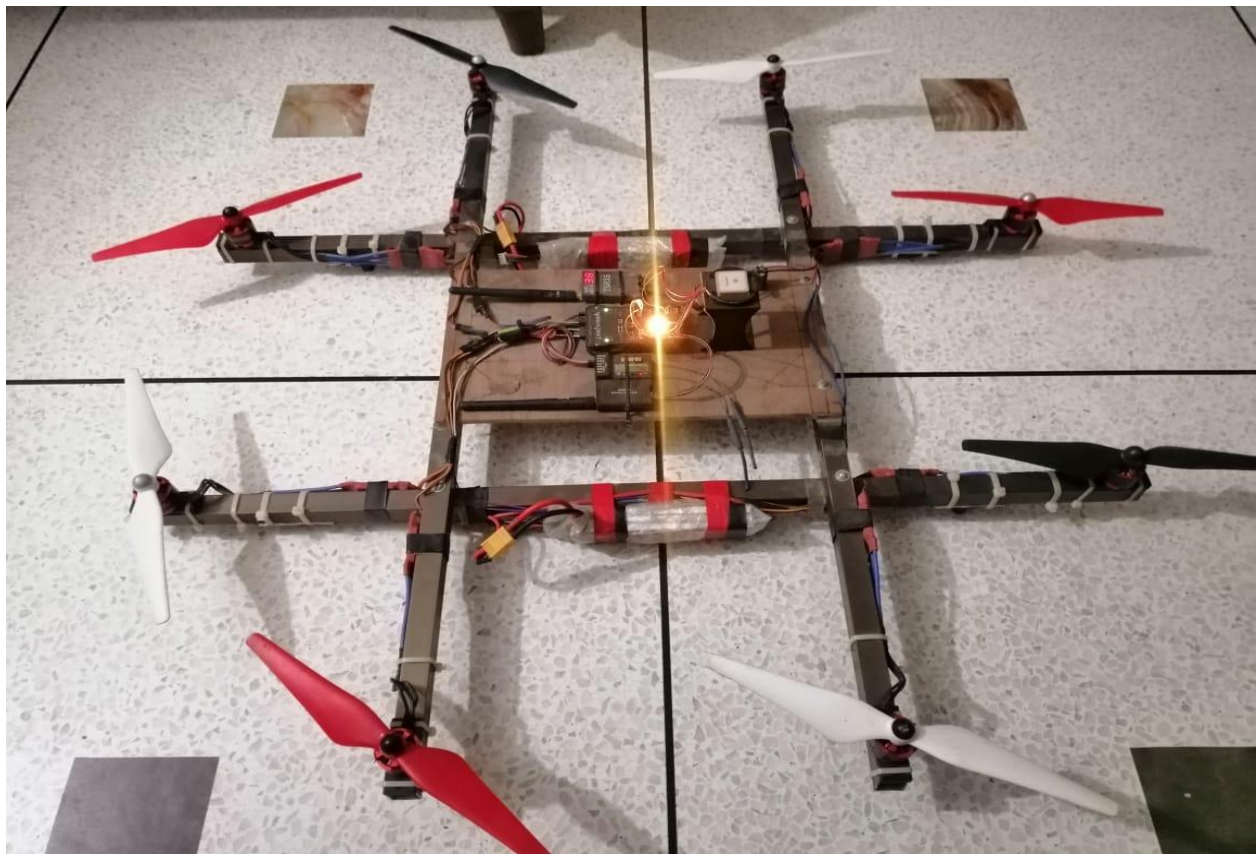


Figure 5.1.1: Hardware Assemble and Calibration

After getting all types of hardware product I assemble this drone. After completing assemble I was calibrate pixhawk board for the first flight. Then I am going to test flight.

And finally successfully done the test flight of this aircraft. Also drone are fly autonomously with the help of radio telemetry. This flight flying time is 20/25 min. This drone can carried 800gm payloads in one flight. After flying aircraft can send data to the web portal. So that drone master and client easily monitor the whole data which get from the aircraft. Also drone master can track the aircraft location via GPS in the web portal. Now I show you the web portal result.

5.2 Web Portal Result

In the web portal my main challenges is get data from the UAV. I completed my challenges. Now I describe how web portal are works.

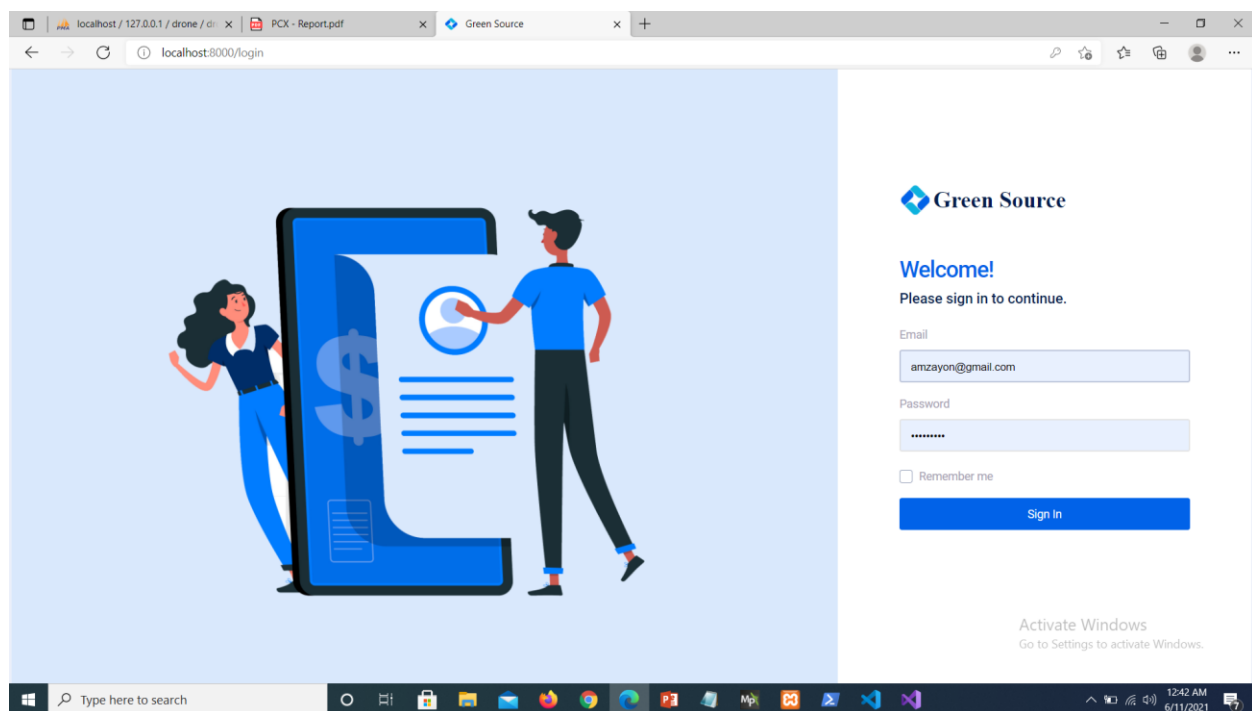


Figure 5.2.1: Login Page (web portal)

In this page user login there email and password. I have three types of user which is Super admin, Admin, and Client. Super admin basically work in the whole system management, admin can operate drone and send data to this portal and client is a landowner or farmers.

The screenshot shows a web browser window with the URL `localhost:8000/dashboard/user/registration`. The page is titled "User / Registration" and contains a form for creating a new user. The form is divided into two main sections: "USER INFORMATION" and a "Submit" button. The "USER INFORMATION" section includes the following fields:

- Role(required)**: A dropdown menu with the text "Select a Role".
- Name(required)**: A text input field with the placeholder "Name".
- Email(required)**: A text input field containing the email address "amzayon@gmail.com".
- Password(required)**: A text input field with masked characters "*****".
- Confirm Password(required)**: A text input field with the placeholder "Confirm Password".

A blue "Submit" button is located at the bottom right of the form. The left sidebar of the application shows the user profile "Ayon Mazumder Super Admin" and a list of navigation items: "Dashboard", "Create User" (highlighted), "All User", "All Drone Data", and "Drone Map". The bottom of the browser window shows the Windows taskbar with the time "12:42 AM 6/11/2021".

Figure 5.2.2: Create USER (Web Portal)

After login as a Super Admin this is the page. Where super admin can create user. Firstly he define a role which is admin or client after that put his or her name, email and password. After click submit button user can login as his role. This access is only for super admin.

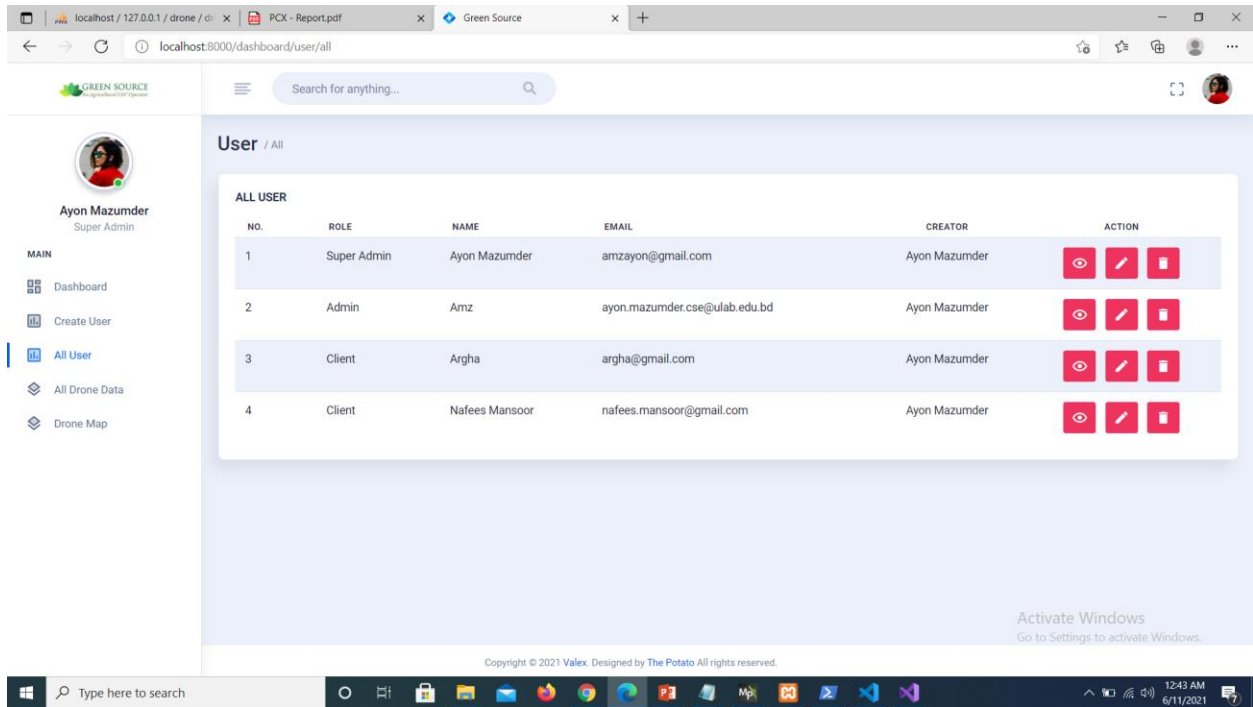


Figure 5.2.3: All USER Data (Web Portal)

In this page Super Admin can view, edit and delete all user data. This access is only for super admin. Other user cannot view or edit or delete data from the portal.

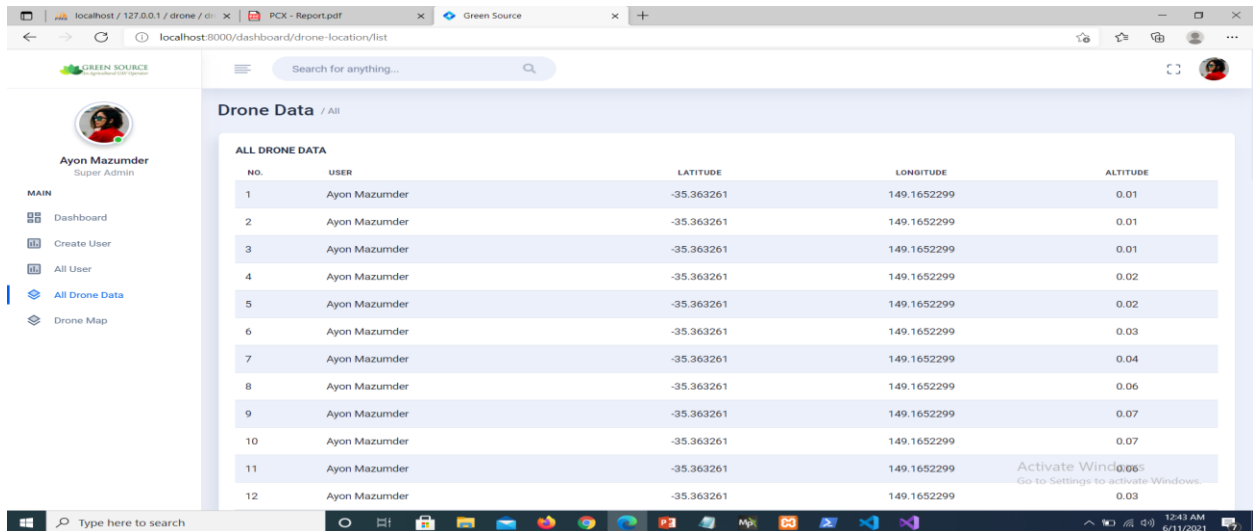


Figure 5.2.4: All Drone Data (Web Portal)

In this page super admin can see all drone data from the web portal. This drone data send from the UAV. When admin operate the aircraft, aircraft will send data to the web portal. Super admin can view all drone data.

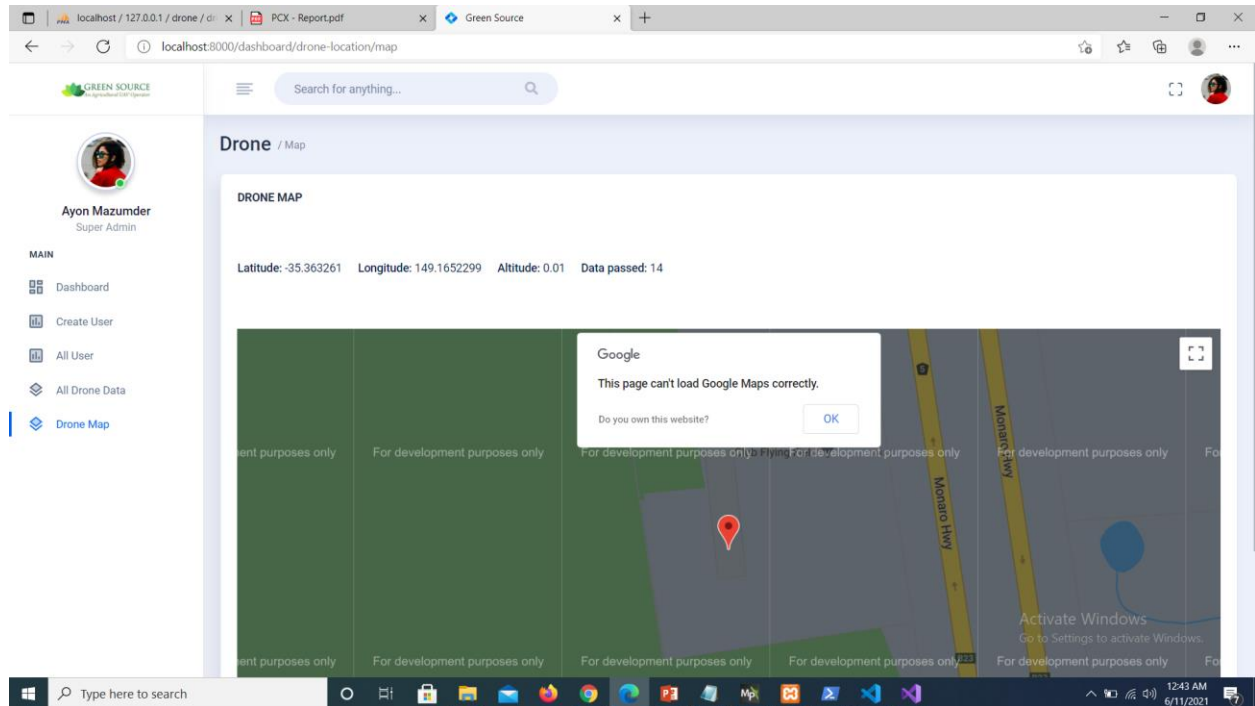


Figure 5.2.5: Drone Map (Web Portal)

For this page super admin can view drone location and last data will stored in the top of the page. This will be monitor from super admin.

That's all from the super admin part. Now I will show you admin and client which are accessed in this site.

ID	Name	Latitude	Longitude	Altitude
15	Nafees Mansoor	-35.363261	149.1652299	0.04
16	Nafees Mansoor	-35.363261	149.1652299	0.05
17	Nafees Mansoor	-35.363261	149.1652299	0.07
18	Nafees Mansoor	-35.363261	149.1652299	0.07
19	Nafees Mansoor	-35.363261	149.1652299	0.07
20	Nafees Mansoor	-35.363261	149.1652299	0.04
21	Nafees Mansoor	-35.363261	149.1652299	0.01
22	Nafees Mansoor	-35.363261	149.1652299	0.05
23	Nafees Mansoor	-35.363261	149.1652299	0.03
24	Nafees Mansoor	-35.363261	149.1652299	0.0
25	Nafees Mansoor	-35.363261	149.1652299	0.0
26	Nafees Mansoor	23.8198459	90.4380649	0.01
27	Nafees Mansoor	23.8198459	90.4380649	0.01
28	Nafees Mansoor	23.8198459	90.4380649	0.01
29	Nafees Mansoor	23.8198459	90.4380649	0.0
30	Nafees Mansoor	23.8198459	90.4380649	0.0

Figure 5.2.6: All drone data from Admin and Client page (Web Portal)

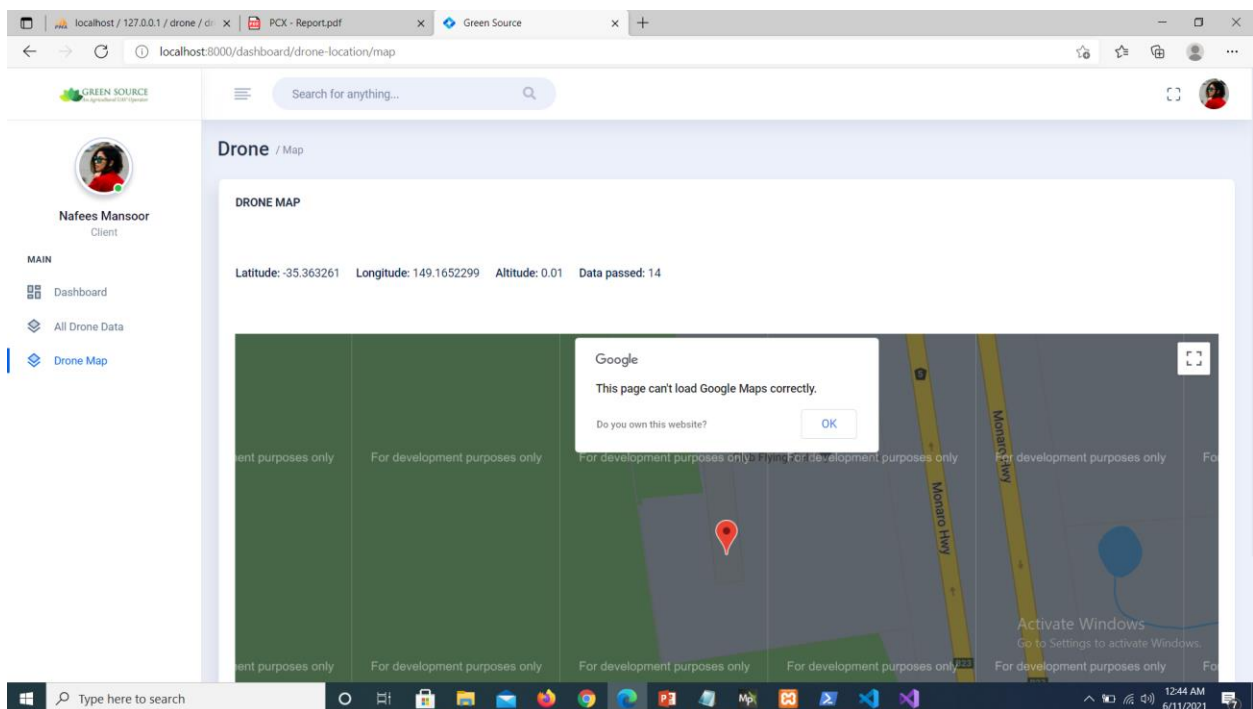


Figure 5.2.7: Drone Map from Admin and Client page (Web Portal)

After login as an admin or client both are view drone data which are get from the UAV. Also can view drone location in the map. Also client can send request to the super admin for assigning an admin who are operate drone in his field. I implemented this features in the near future.

5.3 Desktop App



```
Windows PowerShell
Longitude: 149.1652299
Altitude: 0.05
Times: 2
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.07
Times: 3
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.06
Times: 4
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.02
Times: 5
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.01
Times: 6
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.01
Times: 7
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.01
Times: 8
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.01
Times: 9
send this <Response [200]>
user: 4
Latitude: -35.363261
Longitude: 149.1652299
Altitude: 0.0
```

Figure 5.3.1: Get Data from the UAV (Desktop App)

This is I show you how data are came from the UAV. There is show Latitude, Longitude and altitude of the drone. This data is send to the web portal and after that we view in the figure 5.2.6 I already showed.

In the one semester long project till I can't add desktop app UI. In the near future I add UI of this app.

5.4 Result Analysis

After successfully completed my project I have some analysis which are given below:

- 1) From the very beginning my first challenges is UAV are flying automatically. After getting different types of decision I go with a desktop app which I already made in Python. Also I use some package like dronekit which is python package. So I completed this successfully and showed result already.
- 2) My second challenge is sending data from UAV to web portal autonomously. In the existing software I don't find any API to get data from the drone. After completing my desktop app from the request package I get data to from the UAV to web portal.

So that from my observation Green Source is the flexible to use for user. Also have some feature which are in complicated in the existing software.

That's all about my analysis.

Chapter 6

Future Work and Conclusion

In the end, I have some future work on this project. Soon, I make [4] seed ball [3] which is an important thing in this project. Also, I implemented desktop app UI. Which helps me to fly an aircraft autopilot mood. Also soon, I focused on my hardware so that aircraft can carry more payloads in the aircraft. So that I try to make more efficient aircraft soon.

In the conclusion, Green Source is the more beneficiary product in the current market. Already my work is visible in the previous chapter. So my observation this it is very appreciable market demand because of its simplicity and features. Other systems are more complicated to use in the field. If you are using my system then you can make the drone autonomous and send data in real-time in the web portal also stored it for near future work. In addition, my project best selling features are also unique which is also described in the introduction part.

In my project highly demandable things is drone send automated data and stored it properly. So that my system working procedure is very easy to use.

Throughout the project, I maintain the whole project timeline and finally, I completed it and the whole progress and workflow.

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