GeneBird
Design & Development of Micro Swarm Drones

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Undergraduate Final Year Project Presentation
Dated: 7th January, 2021

Team Introduction

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Major: Computer, Minor: Power

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Specialization:

Major: Power, Minor: Computer

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Idea Behind

- Conducting research on the drone technology is complex and way too expensive.
- The study of feedback control systems and the application of various machine learning algorithms and image recognitions algorithms, is often considered to be tough to be understood from the student's perspective without any practical demonstration.
- Patient is in severe need of blood or an organ, but due to the non-timely delivery, the patient dies.

Idea Behind

- Heavy traffic results in a late delivery.
- In times of crisis Rescue teams need to face huge calamities.
- The inspection of radioactive or hazardous areas is life threatening for humans.
- Security – Patrolling huge infrastructures requires a lot of budget.
- National Security – Modern Warfare

Problem Statement

- Minimizing the cost of multiple drones which have the ability to control through an edge server is a quite complex task.
- Implementation of on board stability for drone flight.
- Short Range of control wifi-signals.
- Difficulty of updating software on soldered flight controller without FTDI board.
- Less computational power for on board implementation of ML based algorithms.

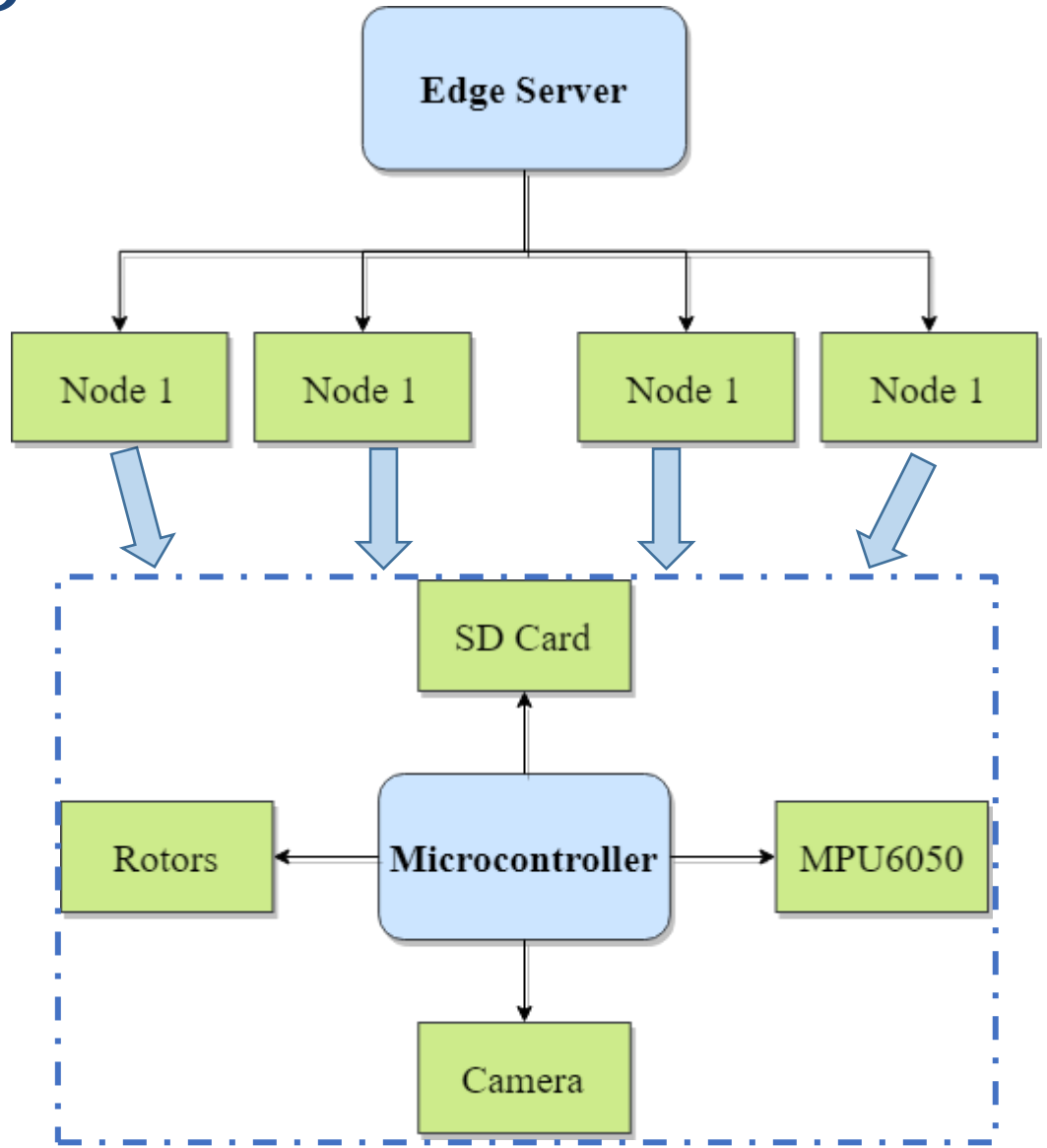
Proposed Solution

- The implementation of swarm algorithm to control multiple drones simultaneously.
- Implementation of PID algorithm for on board stability of drones.
- Increasing the connectivity range using Ad-hoc configurations (Painless Mesh Network)
- OTA support for remote software updates.
- Use of dual core ESP32 microcontroller for implementing ML based algorithms and live video streaming.

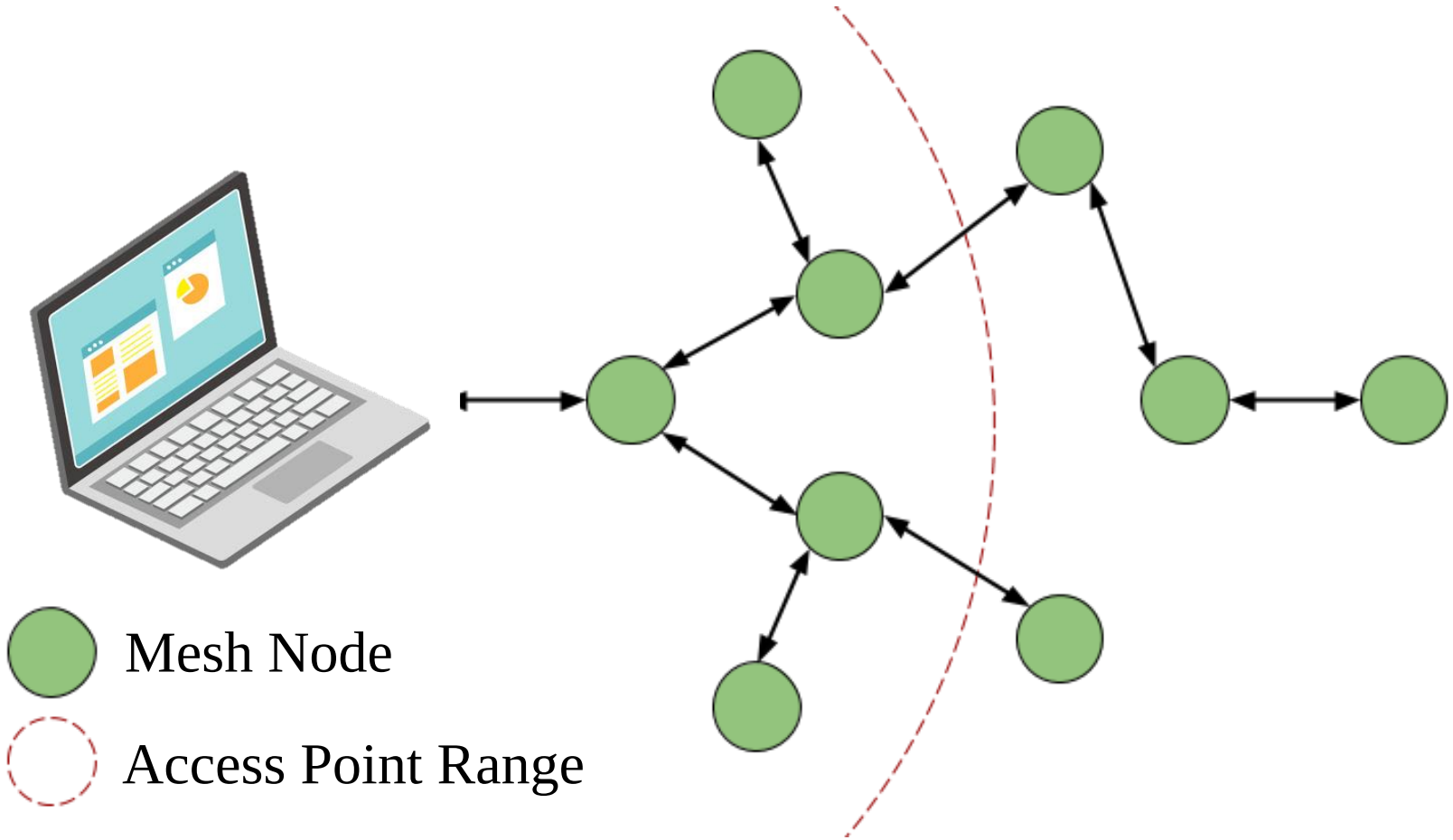
Key Contributions

- Open Source
- On board Stability
- Custom designed Flight controller
- Dual-core Processing
- On board OTA support
- Implementation of Swarm Algorithm
- Implementation of Ad-hoc Network to extend coverage range.

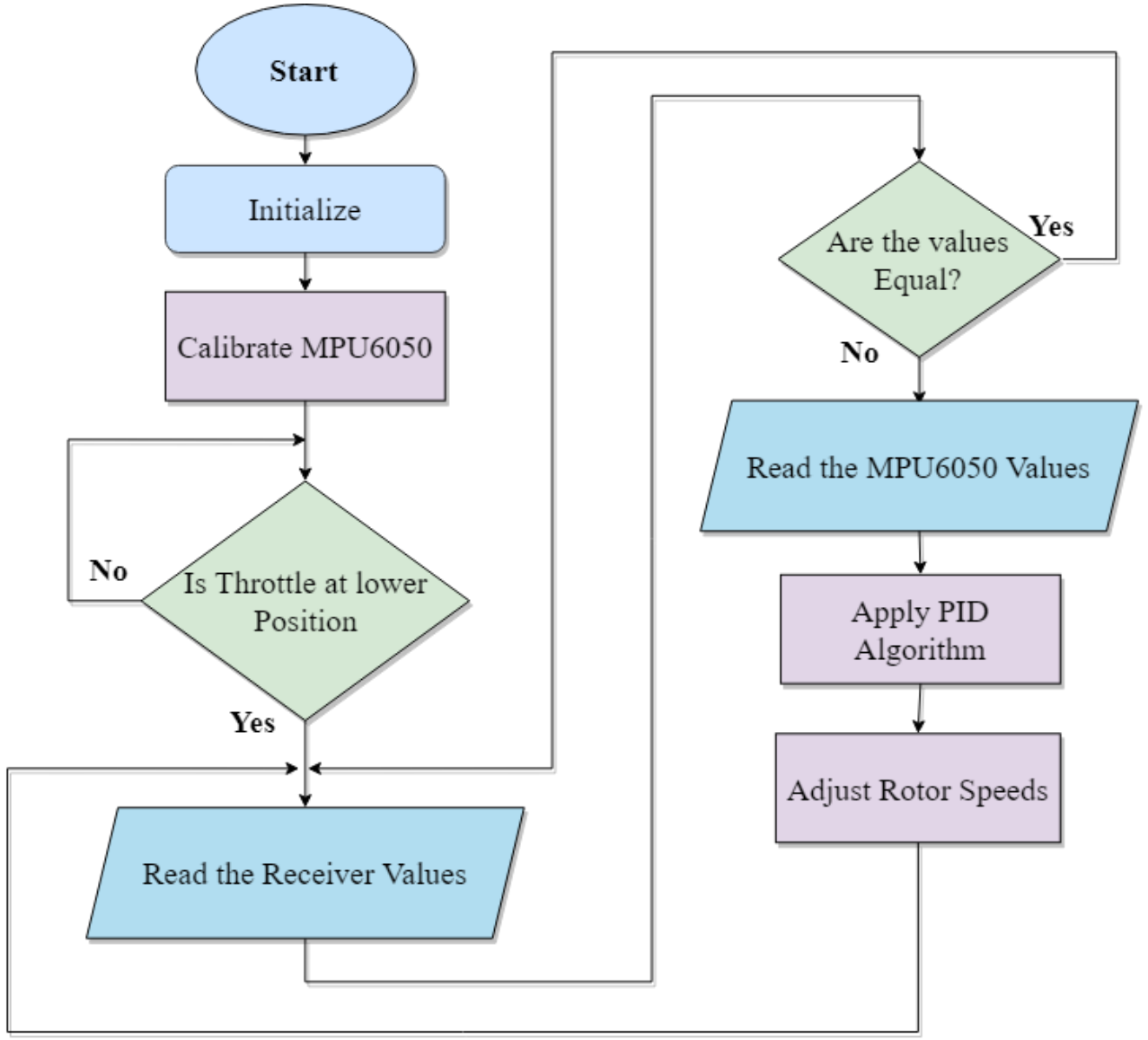
Block Diagram



Block Diagram (Painless Mesh Network)



Flow Diagram (Drone)



Applications

- GeneBird will provide a cost effective frame work for the testing and upscaling of the products developed by the companies as well as the research institutes.
- GeneBird based architectures will be open source and freely accessible for everyone to conduct research on it.

Applications

Genebird based solutions can be used for STEM education by providing inspiring and captivating practical demonstrations of the different machine learning algorithms, computer vision and different control system's concepts.

Genebird based architectures can be used as Mapping drones for mapping radioactive or hazardous areas that are not easily accessible.

Applications

Frameworks based on GeneBird can play a vital role in rescue operations and crisis management operations. Humans are not going to be the first responders anymore.

GeneBird based frameworks can also play a vital role in surveillance and security of large infrastructures and modern warfare i.e. IOBT applications.

Applications

The delay in the delivery of the packages can be reduced by building a system based on GeneBird. The use of GeneBird will not only increases the efficiency but also the productivity of the company, creating less pollution.

Genebird based architectures can be used as Agricultural drones that will increase crop production, and monitor crop growth. They can also be used for planting seeds, and spraying pesticides.

Audience

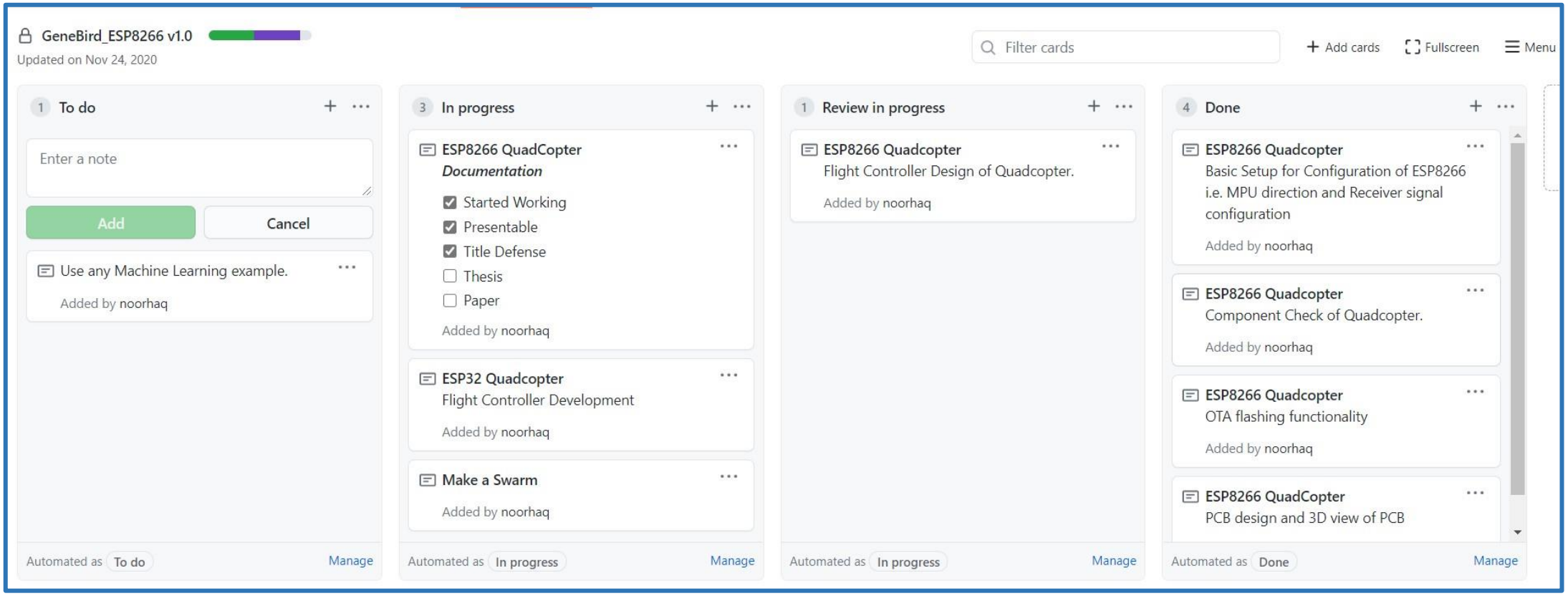
- Educational and research institutions, as well as industries and hobbyists who want to test their upcoming products on the more cost-effective architecture thus developed.
- GeneBird is to play a vital role in universities; introducing students to the various concepts of machine learning and control systems as well as in colleges introducing the students to STEM education.

What we have done so far?

- Designed and Developed Flight controller on TIVA, Arduino/Atmega and ESP based Architectures.
- Implementation of PID algorithm for onboard stabilization of drone.
- Implemented OTA support on ESP8266 based micro drone.

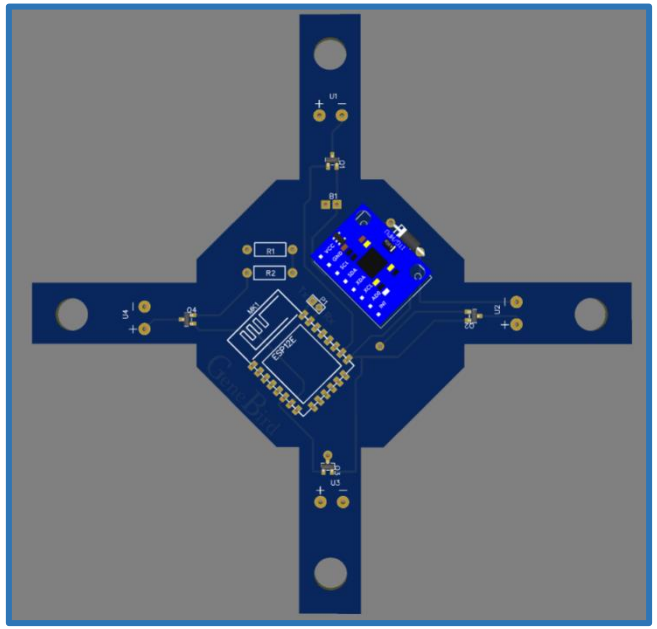
What we have done so far?

- Made Github Repository for code updates and commits.

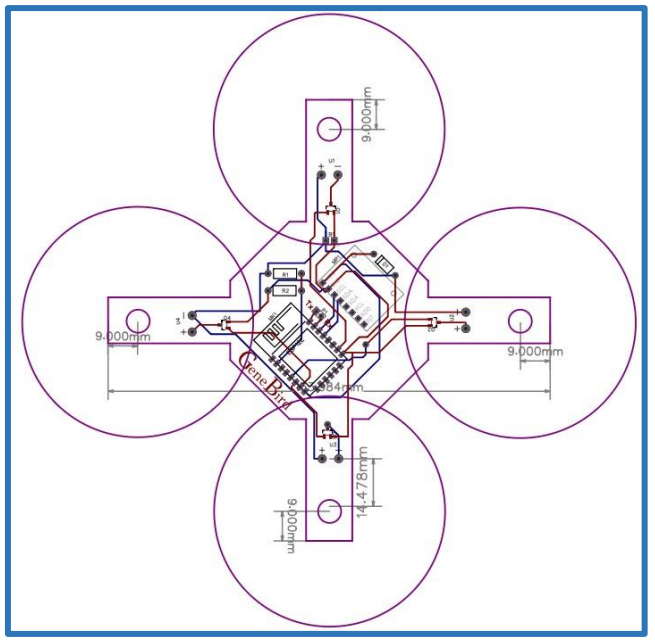


What we have done so far?

- Designed PCB and Flight controller for ESP8266 based micro drone.



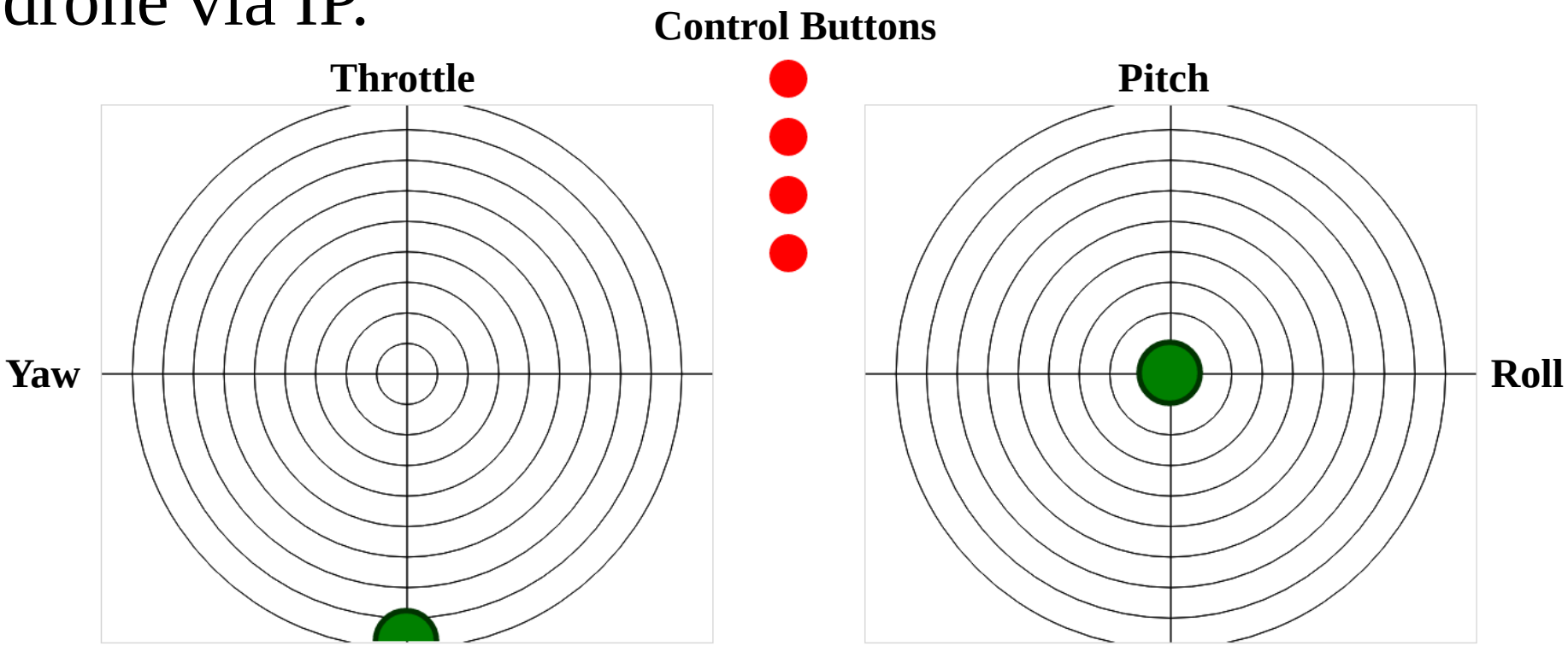
3D Model



Circuit Design

What we have done so far?

- Designed HTML web page to control ESP based micro drone via IP.



Hardware Developed

- Developed drone based on TIVA and Arduino/Atmega Architecture.

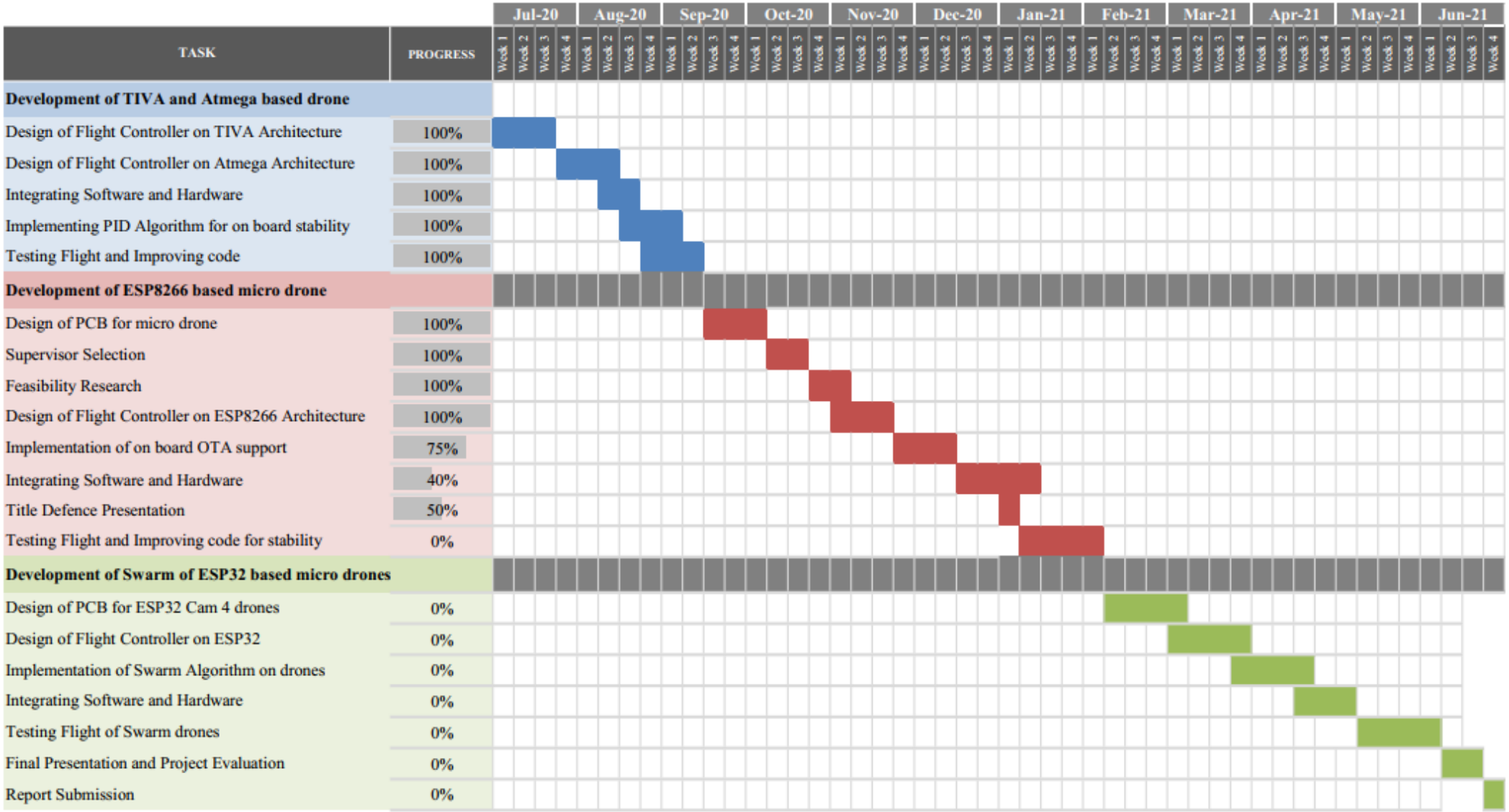
Hardware Developed

- Developed ESP8266 Architecture based micro drone.

Future Deliverables

A swarm of 4 drones, centrally controlled from an edge server, which would have the capability of projecting live video stream from the on-board mounted camera of the controller to the server.

Gantt Chart



TASK	PROGRESS
Development of TIVA and Atmega based drone	
Design of Flight Controller on TIVA Architecture	100%
Design of Flight Controller on Atmega Architecture	100%
Integrating Software and Hardware	100%
Implementing PID Algorithm for on board stability	100%
Testing Flight and Improving code	100%
Development of ESP8266 based micro drone	
Design of PCB for micro drone	100%
Supervisor Selection	100%
Feasibility Research	100%
Design of Flight Controller on ESP8266 Architecture	100%
Implementation of on board OTA support	75%
Integrating Software and Hardware	40%
Title Defence Presentation	50%
Testing Flight and Improving code for stability	0%
Development of Swarm of ESP32 based micro drones	
Design of PCB for ESP32 Cam 4 drones	0%
Design of Flight Controller on ESP32	0%
Implementation of Swarm Algorithm on drones	0%
Integrating Software and Hardware	0%
Testing Flight of Swarm drones	0%
Final Presentation and Project Evaluation	0%
Report Submission	0%


THANK YOU