
Building Smart Drones

Make Human Life Easier with Drone

Design Document



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1 Introduction

1.1 Purpose of this Document

To build Smart Drones by providing step-by-step tutorial for the high school students, which includes the whole process of assembling and building the drone with the Component list, Calibration, Assembly, Drone Building documents with the software and code used to control and fly the drone. This document focuses on technical designs and Architecture of Building Smart Drone project.

1.2 Scope of the system

Design document illustrates the detailed design of the project. Including components of the drone, with Assembling, Calibration and Software for the implementation.

1.3 Overview

Building Smart includes implementation of three drones with an aim of design of a Follow Me drone, which follows a device or an object; the device can be a phone or a device with some sensors that continuously communicate with the drone to get the right position. Mission control drone which aims to reach target places and return to its initial position along with its route monitoring. Implement a drone for aerial photography and videography.

2 Components

Drone frame, Motors, Propellers, Speed controller, GPS chip, Battery, Ardupilot, Telemetry, OTG Connector, Smart Phone.

3 Assembling

3.1 Assembling the frame: Includes assembling of frame arms, four leg plates, two rods for the base mount, one top plate, one bottom plate for mounting the power lines, and screws.

3.2 Connecting the motors: Connect motors to drone frame arms and connect each motor to each ESC (speed controller) with soldering.

3.3 Connecting the ESC: Use single 4 ESCs and each ESC has eight wire, from which three wires connect to motor, two wires connect to power unit and remaining three wires signal, power and ground goes to ardupilot.

3.4 Connecting the Ardupilot: Connect Telemetry's air module to telemetry pin of ardupilot for the smart phone and drone communication, Connect GPS module to GPS pin, 4 ESCs to output pins of ardupilot.

3.5 Connecting the Battery: Connect battery to S500 frame using board and soldering.

3.6 Connecting the Telemetry: Telemetry have two modules. One is ground module, which connects to smart phone using OTG connector and air module connects to Drone's ardupilot.

4 Calibration:

Calibration can be done using APM Planner software.

4.1 Configuring the quadcopter: Connect Ardupilot to Computer using USB and in APM planner software then do calibration, first do installation of Firmware with disconnection of ardupilot and computer connection, then select frame type.

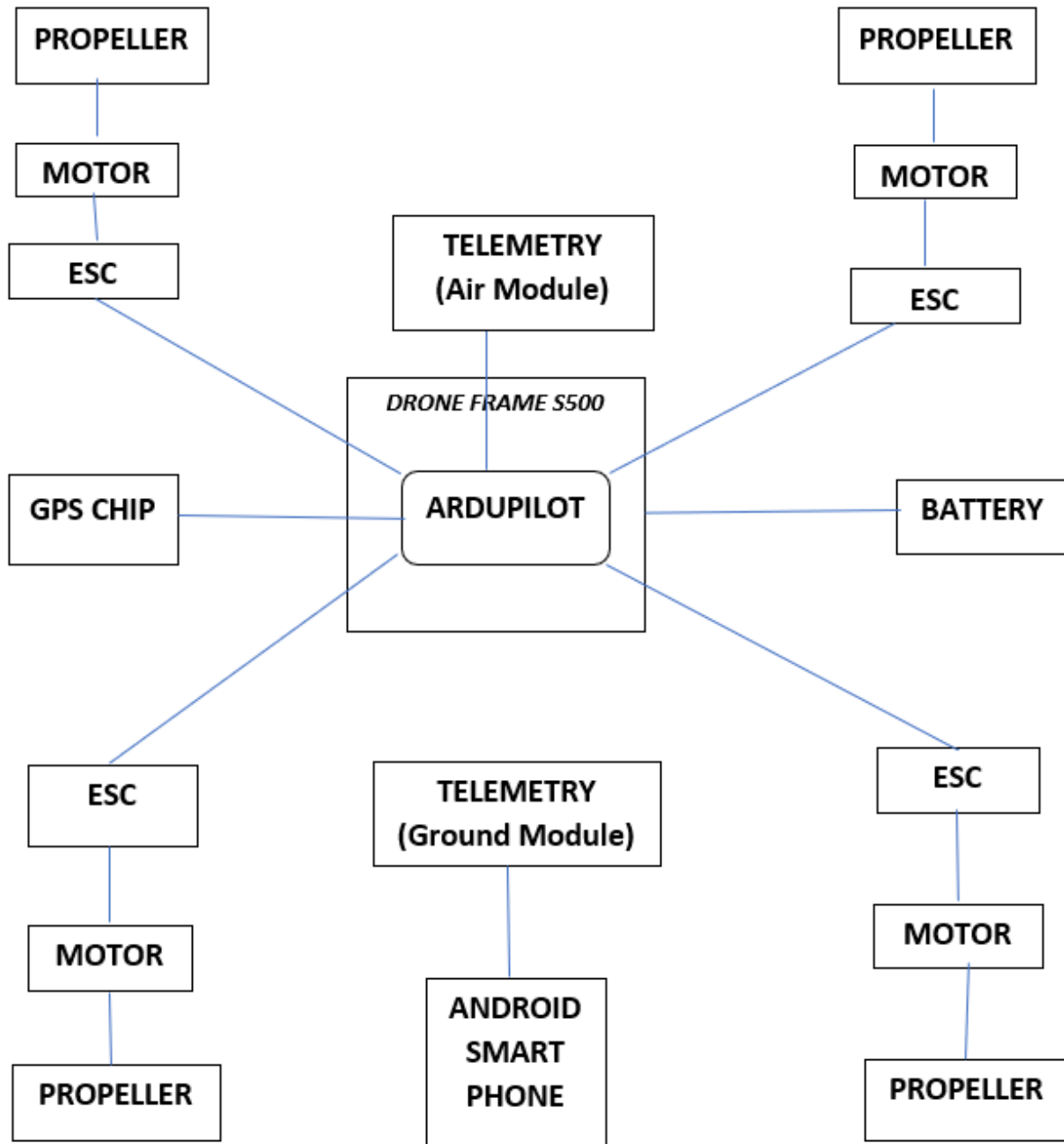
4.2 Compass calibration: In APM planner software select compass option check "Enable" and "Auto Detection" options and rotate frame do calibration.

4.3 Access calibration: Select orientation of the drone properly and calibrate accordingly software instructions.

4.4 Flight mode calibration: Do calibration for the different flight mode such as RTL, Stabilize etc.

4.5 Failsafe calibration: This calibration helps to protect the drone when its loss the connection in communication.

5 Architecture Design



Drone main functionality done by Ardupilot. It is responsible for the stability of the drone, providing connection between drone and smart phone. Ardupilot control the drone.

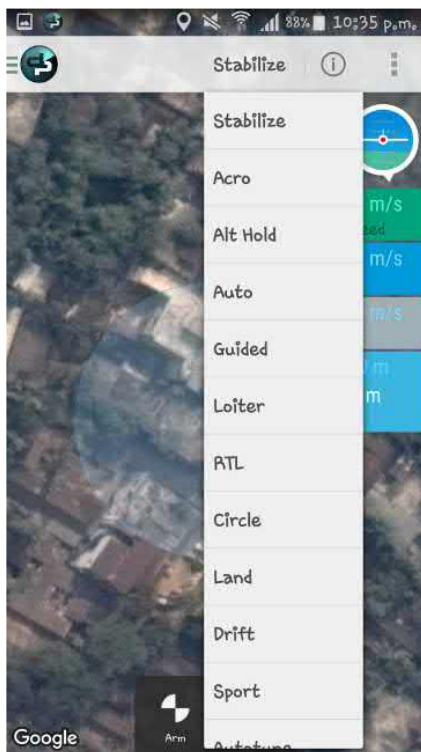
Mount the motors and propellers on the drone frame's arms Then 4 single ESC (speed controller) connects to each motor with two of them are configured anti-clockwise and other two are configured clockwise. 4 ESC's signal, power and ground wires connect to output pins of ardupilot.

Communication starts with control of the drone from the ground using smart phone with telemetry connected and send signal remote signal from ground telemetry module to air module of telemetry which is connected to drone's ardupilot, after that ardupilot is responsible for the further action by giving output to 4 ESC to move and ESCs do action using motors and battery's power supply.

6 Implementation

Implementation done using different software in computer and mobile applications. Implementation include programming in C language.

- **APM Planner:** Install in computer and use for the calibration.
- **Blynk Application:** Install in mobile and use for creating project with Arduino.
- **Droid Planner2:** Mobile application for Follow me drone and giving a target points to Mission planner drone.



Mission Planner Software: Set target points in Mission planner software.

