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Designing and Fabrication of Quadcopter and Applying Voice Transmission as a Communication Application

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ABSTRACT: The goal of our group's project is to design and build an autonomous quadcopter from scratch. This means going through the process of researching previous models, performing calculations, purchasing individual parts, testing those parts, designing the final product, designing an Arduino based controller, and finally fitting everything together. All this is to be done with the minimum amount of outside help we can manage (i.e. not using pre-determined code, not buying a boxed set of materials). After deciding how big we wanted our quadcopter to be and purchasing the appropriate parts there were four primary design steps on the way to the final product. First we had to learn to control and program the ESCs using an Arduino. Next we used a spring-mass test setup to determine a relationship between force and displacement, and thereby determined the relationship between force and pulse width of the signal going into the ESC. Once we felt comfortable with our ability to communicate with the ESC we used another test setup comprised of a rotating bar suspended between two beams to practice stabilizing the system in 1 degree of freedom (roll). Following success stabilizing in 1-DoF we designed our final test setup comprised of two vertical bars to which the body of the quadcopter is attached. Using this rig we were able to test and stabilize in 2-DoF (roll and pitch), have the quadcopter translate vertically, and introduce small disturbances for which the system controller was able to compensate automatically. Our main research work on to making a communication or voice transmission quadcopter which are communicate and interact with people in different types of situation

KEYWORDS: Communicating device, GPS, Save lives, live guidance, Quad copter, 1.4Kg Payload

I. INTRODUCTION

A quadcopter is an aircraft lifted and propelled by four horizontal rotors; each rotor consists of two or three rotor blades. Quadcopters are classified as rotorcrafts or a rotary-wing aircraft to distinguish them from fixed-wing aircraft because the quadcopter derives its source of lift from the rotor blades rotating around a mast. They belong to a larger category of aircrafts defined as multicopters.

Multicopters have various names based on the number of propellers mounted on the craft. A four-propeller multicopter is called a quad-copter, a six propeller multicopters is called a hexa-copter, and nowadays we even have octo-copters.

Over the last few years, remote control airborne vehicles have been incredibly popular for hobbyists, academic research groups, and for individuals who are planning for a start-up. The names of these vehicles vary from quadcopters to quadrotors or even drones. However, they refer to the same vehicle and the most appropriate nomenclature for these crafts is quadrotors. For the sake of simplicity, we will call them quadcopters.

This book will cover the basics of a quadcopter and will guide you on how we are going to build a simple and fully functional quadcopter that is equipped with a camera and walkie talkie.



II. PROCESS AND WORKING

1) Calculations

THRUST=(TOL. WEIGHT X2.2)/NO. OF MOTOR =(1.4KG X 2.2)/4=770 GRAM EACH.

WHERE:- 2.2 IS THE THRUST TO WEIGHT RATIO(THIS IS THE WEIGHT THAT ONE MOTOR IS ABLE TO LIFT OFF THE GROUND.)

Time = (capacity * discharge) / AAD

AAD = (AUW * P) / V

(P / V) is the definition of an electric current (I).

Therefore,

AAD = AUW * I

QUADCOPTER FLIGHT TIME CALCULATION:-

Time = (capacity * discharge) / AAD

AAD = (AUW * P) / V

= (1.4Kg X 120W/Kg) / 11.1 Volt

= 15.13 Amp

Therefore,

Time = (Capacity X Discharge) / 15.13

Capacity = Battery (5200Mah) = 5.2Ah

Discharge = 80%

Time = (5.2 X 80) / 15.13

= 27.49 Min

III. COMPONENTS

1. Flight controller – APM V2.1 Flight Controller
2. Glass Fiber Flight Controller Anti-vibration/Shock absorber Set
3. GPS - NEO-M8N GPS Module
4. Antenna - GPS Folding Base Antenna set
5. Telemetry- 915MHZ Radio Telemetry
6. Propellers - 1238(12X3.8) x 4
7. Frame -500 Glass Fiber Frame ESC Power Distribution Board
8. ESC - 40A 2-6S Brushless Electric Speed Controller
9. Remote Controller - FlySky FS-i6 2.4G 6CH PPM RC Transmitter with FS-iA6B Receiver
10. Motor- EMAX MT3515 335KV Brushless DC Motor
11. Battery - 8000mAh 6S 35C/70C Lithium polymer battery Pack (LiPo)

IV. CALCULATIONS

Tower is a powerful and intuitive flight control program that we are using for enabling autopilot features. It provides everything we need to plan, fly and track any ArduPilot powered drone. Tower delivers a simple but feature-rich flight experience. It's also an open-source app, which means the code is available to us if we want to build new features into Tower or customize existing ones.



IV. DESIGN

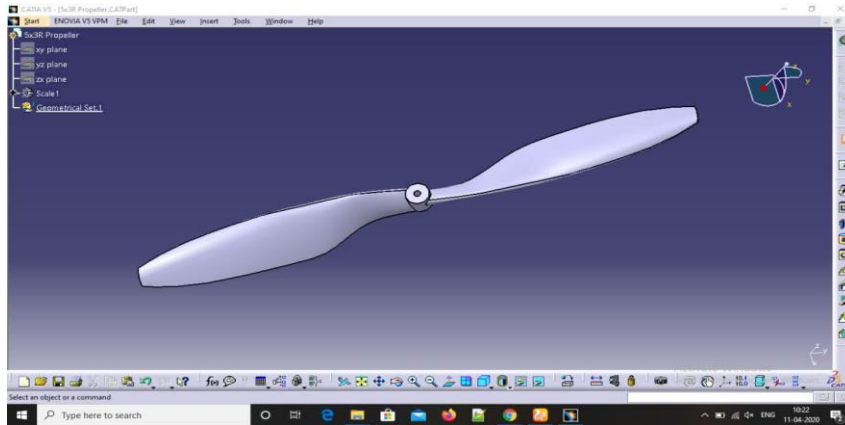


Figure.1-Propeller blades

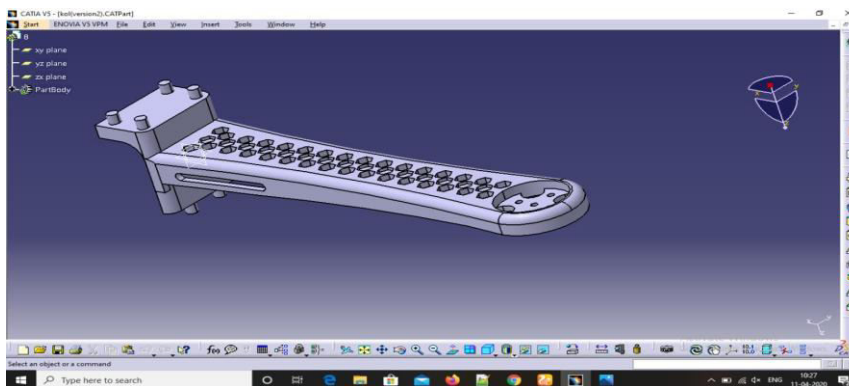


Figure.2-Remote controller

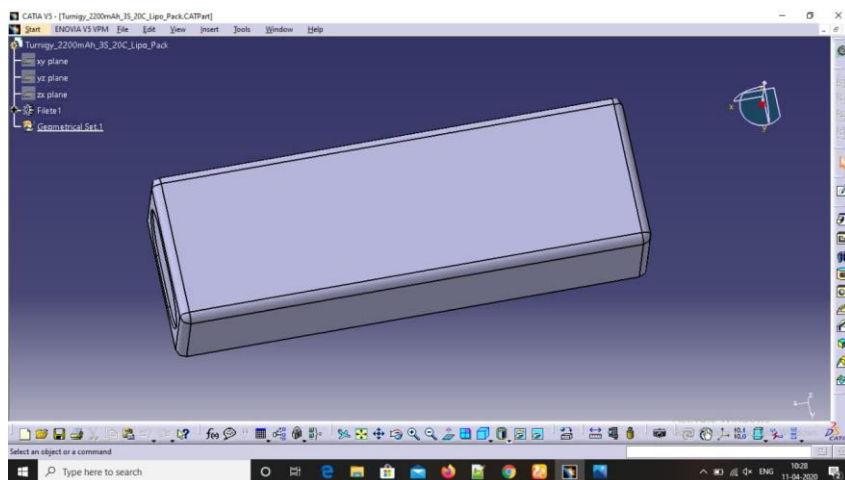


Figure.3- Frame

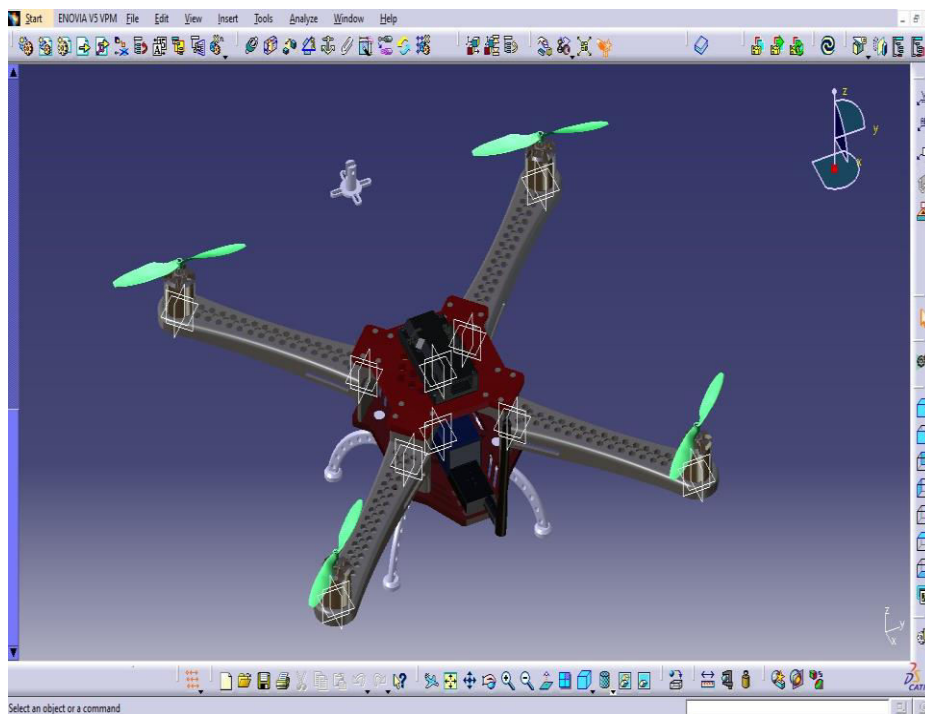


Figure. 4- Quadcopter assembly



Figure.5- Actual Model



VI. CONCLUSIONS

- While the initial goal of creating a quadcopter capable of communicating was not reached till this semester.
- Our group still learned a substantial amount about drone design, control, range parameters, types of drones and communication methods and researched what fits best for our project.
- In this semester we succeeded in stabilizing the quadcopter and then tried with communication purposes.
- The end of the project is bittersweet and we are still trying to find out new ways to improve the communication.
- The voice transmission works pretty well and can be brought to public for use.
- Our quadcopter can be used in many situations for communicating purposes for the mankind.

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