

Quadcopter Design and Fabrication

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Abstract: Quadcopter, Quadrotor, Drones, Unmanned aerial vehicle various names, various aspects and various implementations given to the single device. A device that can be controlled from a remote location, monitor it, get a video or image data, process it and act according to it. The various quadcopters designed are to be focused on their weight, designing, application etc. The quadcopter that we are ahead to develop mainly emphasis on the cost effectiveness and the sensors implemented in it. Most of the quadcopters are application oriented they are limited to their own application. The efforts from us are made to erase these problems and derive a feasible solution that is going to overcome all these problems.

Keywords: Quadcopter, Autonomous Flight, UAV, PyQuadSim.

I. INTRODUCTION

Due to the various applications, costing, and the most prominent thing human safety led to the researches in Unmanned Aerial Vehicle. As well as its various advantages over helicopter and the challenges in it led to enhancement in quadcopters. Quadcopter requires dynamics in order to account for gravity effect and aerodynamic effects [5]. As said it's a flying device it operates on various mechanical i.e. hardware parts. The mechanism of Electronics, mechanical and Computer applied in a intelligent manner to achieve the goal. The arrangement of quad i.e. four rotors, designing of frames, commands to the board with a specific input values(x, y, z, θ , ϕ , ψ) to achieve thrust and torque(direction and speed) for the quadcopter is the basic thing in it [2][4].

II. QUADCOPTER MOVEMENTS

The thrust and torque are the very basic two things used for movement of quadcopter. The movement are decided on the input values(x, y, z, θ , ϕ , ψ) provided to it. The movements are :

A. Yaw Rotation :

Each of rotors on the device produces both thrust and torque. Initially there are front-left and rear-right motors both rotate counter clockwise and other two rotate clockwise, the net aerodynamic torque will be zero [6]. Yaw decides the direction of the quadcopter.

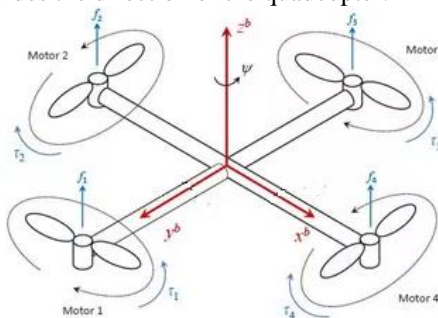


Fig. 1. Yaw Rotation

B. Pitch Rotation :

Motion of the Quadcopter about the lateral axis is termed as pitch. It decides the movement of quadcopter either forward or backward.

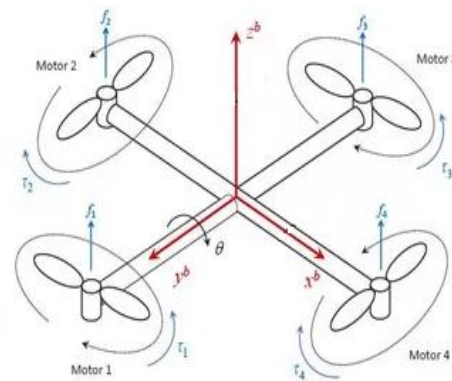


Fig. 2. Pitch Rotation

C. Roll Rotation :

Motion of the Quadcopter about the longitudinal axis is called as roll. It makes Quadcopter to fly either right or left.

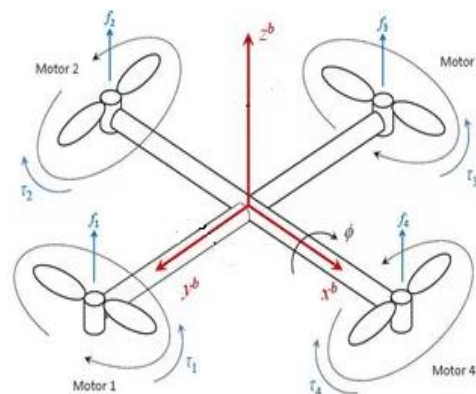


Fig. 3. Roll Rotation

III. LITERATURE SURVEY

The literature survey has been done in aspects with the history of copters, the techniques used, selection criteria for the hardware and the software compatibility.

A. Tulio Salazar, "Helicopter Dynamics, Simulation and Control", June 2011

This paper emphasis on the thermodynamics properties. Helicopter or Plane was the first flying machine to be

developed. It had certain problems of which the main problem was the hovering. This is the problem of sustaining in one place for long time.

B. Anton Nakazawa and Bai Xiang Jin, “Quadcopter Video Surveillance UAV”, December 2013

This paper stress on the data captured through the camera. The data can be audio or video. To obtain a clear vision of the data or what is going in the video the basic need is the use of professional and a clear vision camera lenses in the device which are more expensive.

C. Board Selection Criteria

As all the command has to be provided through the board so there are certain criteria which need to be understood before selecting the board. The very first thing is to make sure that the board fulfil the requirements of the application. It should also be easily programmable and user friendly also the thing to be point out is the cost of the board.

D. Languages Used

To program a copter or device the selection criteria for the languages to be used can be on the basis of its implantation and compatibility with the hardware. Matlab and Java are the two languages which have proved to be the best languages in support with the hardware. But also Python language can be proved to be the best language for programming boards for working of copters.

create is trying to be capable of sustained autonomous flight. Our platform can be outfitted with additional sensors (cameras, wireless technology) to expand the overall usefulness and flexibility of the Quad-copter design. Fabrication and soldering are challenges; a little careless would result solder touch each other and it is hard to notice. But all these are solvable once we have more experience on PCB design, like math problems.

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IV. DESIGN AND METHODOLOGY

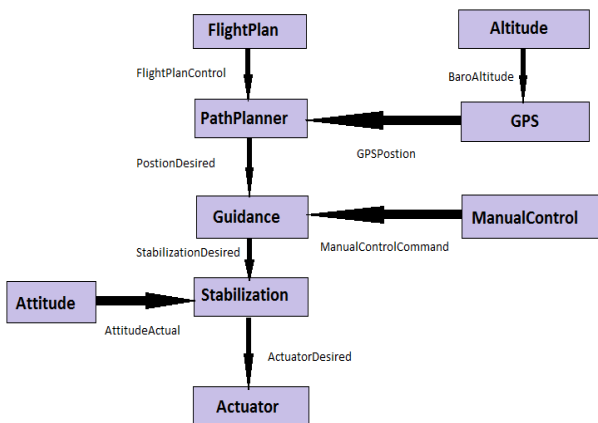


Fig. 4. Propose Architecture

Currently we are Integrating Graphical User Interface (GUI) with the hardware to achieve the desired goal of building autonomous quadcopter which will allow direct control over the system. For this we are using Python-Quadcopter-Simulator (PyQuadSim). It is open source framework which is used for controlling the flight of quadrotor. Powerful Virtual Robot Experimentation Platform (V-REP) is used in this framework. Also we can add the various sensors and features as per our requirement by modifying the source code written in python.

V. CONCLUSION

Literature survey for quadcopter and flight controller has been successfully completed. The platform which we will