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A REVIEW ON

"UNMANNED ARIEL VEHICLE CUM REMOTELY PILOTED AIRCRAFT AGRICULTURE SPRAYER DRONE"

Asst. Prof. Hitesh Pandit[1], Sarvaiya Sunil D[2], Sakariya Prakash D[3], Patel Pratik R[4], Kamejaliya Akshay[5],

[1]*Department of Mechanical Engineering, Shree Pandit Nathulalji Vyas Technical Campus, Surendranagar, Gujarat - 363030, India*
[2]*Department of Mechanical Engineering, Shree Pandit Nathulalji Vyas Technical Campus, Surendranagar, Gujarat - 363030, India*
[3]*Department of Mechanical Engineering, Shree Pandit Nathulalji Vyas Technical Campus, Surendranagar, Gujarat - 363030, India*
[4]*Department of Mechanical Engineering, Shree Pandit Nathulalji Vyas Technical Campus, Surendranagar, Gujarat - 363030, India*
[5]*Department of Mechanical Engineering, Shree Pandit Nathulalji Vyas Technical Campus, Surendranagar, Gujarat - 363030, India*

Abstract — UAV : An unmanned ariel vehicle as it name suggest it is unmanned (Humanless) ariel vehicle commonly referred to as a drone. RPA : Remotely Piloted Aircraft defines that it is remotely operated drone using R.F remote module provides wireless control.
We have tried to make agricultural drone which can fly with advanced stability and smoothness controlling Pitch, Roll and Yaw for that we have used different essential basic components that enable multifunction features and other components to provide more advanced benefits. More ambitious , economical and highly featured sprayer provides facility of spraying insecticides and pesticides to avoid labor. So, finally we can say that all the components are chosen so that can give more features to our agricultural drone such as Stability , Smoothness , Reliable , Drastic , Durable , Economize , Autonomous and highly Smart

Keywords – unmanned ariel vehicle, Remotely Piloted Aircraft, Agriculture sprayer drone

I. INTRODUCTION

1.1 OVERVIEW OF PROJECT:

First of all the basic information about drone.How it work and how it run and controll by raddio controller, and other information on drone component and it's types.
Our project based on the spraying system of agriculture.
The basic theame of project is related to problem are generate in agriculture, like the men are not able to sprying insecticides or pesticide when soil is wet or high height of crope.
This project is an agriculture problems, like reduces the labour cost & reduce the time, and also increase working efficiency by drone.
So our project is UAV cum RPA agriculture sprayer drone.

1.2 SCOPE OF WORK:

Scope of our project is reduce the cost of labour & reduce the time, and also increase working efficiency by drone.
The problem is to decrease the labour requirement & increase working efficiency and accuracy.
Due to use of drone we can easily spraying a insecticides & pesticides when wet soil or high height of crope.

1.3 OBJECTIVE OF PROJECT:

By use of Radio controller we can get a verry accurate & smooth operation by drone.
So finally we can say that all the components are choosen so that can give more features to our agricultural drone such as Stability , Smoothness , Reliable , Drastic , Durable , Economize , Autonomous and highly Smart.

II. LITERATURE REVIEW

2.1 Mathematical Modelling and Parameter Identification of Quadrotor

BY Anezka Chovancovaa, Tomas Ficoa, Ľubos Chovaneca, Peter Hubinsky. et.al(1).

ABSRACT:

In this paper, we present a comprehensive mathematical modeling and parameter identification for constructing small - scale UAV quadrotor . Mathematical Model parameters can be obtained via experimental identification, calculations or the combination of both ways. This paper also include consists of serval basic of some additional components. These parameters are arm length, total mass of the quadrotor, inertia matrix, friction coefficients, thrust coefficient and drag coefficient. Experimental identification of an actuator usually required the usage of a test bed.

CONCLUSION:

Knoledge of the dynamic of the quadrotor is essential when designing a controller. IN a paper various mathematical models of a quadrotor were derived. The selected method for designing level controller determines whether the linear or the non-linear model will be used. The identification of the rotor dynamics can be used to reduce power consumption and improve the control of the rotor of the quadrotor.

2.2 A Brief History of Early Unmanned Aircraft- BY John F. Keane and Stephen S. Carr.et.al(2).

ABSRACT:

Current developments in unmanned aerial vehicles (UAVs) trace their beginnings to World War I. Efforts during the Interwar Period, World War II, and afterward ultimately led to the development of cruise missiles such as Harpoon and Tomahawk, aerial targets, and the current family of UAVs. UAVs have the ability to transmit to the battlefield commander real-time intelligence, surveillance, and reconnaissance information from hostile areas. They can also act as communication relays, designate targets for neutralization by other assets, or attack the targets themselves with onboard munitions and then loiter while streaming real-time battle damage information back to friendly forces—all without risking the lives of an aircrew. This article provides a historical survey on the early development of select UAVs in the U.S. military and their military applications. The development of cruise missiles and UAVs is intertwined. As the reader will see, many of the technologies experimented with in cruise missiles made their way to UAVs, and vice versa. Although making mention occasionally of cruise missiles, this article will attempt to focus on selected UAV development and employment through the Persian Gulf War.

CONCLUSION:

Building a quadcopter becomes easy after referreing that UAV drone. The basic need to build the quadcopter can be understand. The UAV is a unmanned ariel vehicle is the most unique as world is going forward to the new technology.

2.3 A Control Design for Quad Rotor UAVs with Input Unmodeled Dynamics. BY-Prashanth Krishnamurthy AND Farshad Khorrami.et.al(3).

ABSTRACT:

A general six degree of freedom dynamic model of a quadrotor with unknown input unmodeled dynamics is considered and a nice control design is proposed for good stabilization and up tracking. The proposed controller is the disturbance forces and torques as well as uncertain nonlinear dynamic input complex. The proposed dynamic controller is based on a backward based controller design for the nominal six degree-of-freedom dynamics of the quadrotor system and a scaling-based redesign of this nominal controller utilizing a dynamic scaling parameter and a dynamic

CONCLUSION :

By analysing this literature we can understand the brief overview of movement of UAV drone.
The flight autonomy is good as well as the control action.

2.4 Autonomous path tracking control design for a comercial quadcopter BY Raul M. Criado and Francisco

R. Rubio et.al(4)

ABSTRACT:

This paper describes the methodology followed to design a functional autopilot for the quadcopter AR.Drone. The main goal is to design a control strategy for autonomous path tracking in the XY plane and comparing two different control techniques. Three phases are carried out to achieve this objective are - model identification, control design and evaluation, and implementation. At the identification phase two Hammerstein models are obtained, they are characteristic by having a static nonlinearity preceding a linear transfer function. The control design phase is based on the use of a control to regulate the position with an inner speed control design phase is based on the use of a cascade control to regulate the position with an inner speed.

CONCLUSION :

Controlling is described in this literature. As control action is most significant for any drone it is helpful for begginers. Here it is control action which is essential for any of the drone.

2.5 Model Predictive Control for UAV Automatic Landing on Moving Carrier Deck with Heave Motion :BY Soyeon Koo, Seungkeun Kim and Jinyoung Suk.et.al(5)

ABSTRACT:

This paper investigates a model predictive automatical carrier landing system considering the motion of carrier. With the medium altitude longer endurance UAV and carrier models, the guidance and control for safe shipboard landing use the relative geometry between the UAV and carrier deck into accounts. The automatic carrier landing system is operated by two types control system. One is the linear quadratic tracker with integral designed to track the desired slope. The other is the model predictive control which finds the optimize control input sequences over a certain time horizon by predicting the future motion of the UAV and the carrier deck.

CONCLUSION:

For appropriate landing the control is nice to have of high skilled level for more stability. If any problem in landing then it can cause damage to the whole stucture. So the landing is required to understand.

2.6 Nonlinear Balance Control of an Inverted Pendulum on a Tiltrotor UAV:

BY: **Marcelino M. de Almeida , Guilherme V. Raffo. Et.al(6).**

ABSTRACT:

This paper proposes a cascade nonlinear control strategy to solve the problem of balancing an inverted pendulum using a tiltrotor Unmanned Aerial Vehicle while tracking a desired position references. For the present study, the aim is to maintain both the aircraft and the pendulum stablity throughout the whole trajectory, even in the presence of parametric uncertainties and measurement errors. The system is modeled via Euler-Lagrange formulation considering both the dynamic of the tilt-rotor UAV and the pendulum. As for the nonlinear control design, a three- level cascade strategy is proposed. Each level of the cascade system executes a control law designe through the method of input output feedback linerlizations.

CONCLUSION:

The balancing of quadcopter or else any other multicopter is the main requirement. To get great stability balancing is essential feature. Balancing of UAV is hard as it is unmanned and controled externally by the remote control module.

III. CURRENT SYSTEM

TYPES OF DRONE :

- TRI COPTER

- QUAD COPTER
- HEXA COPTER
- OCTA COPTER
- Y6 MULTYROTER
- X8 MULTYROTER

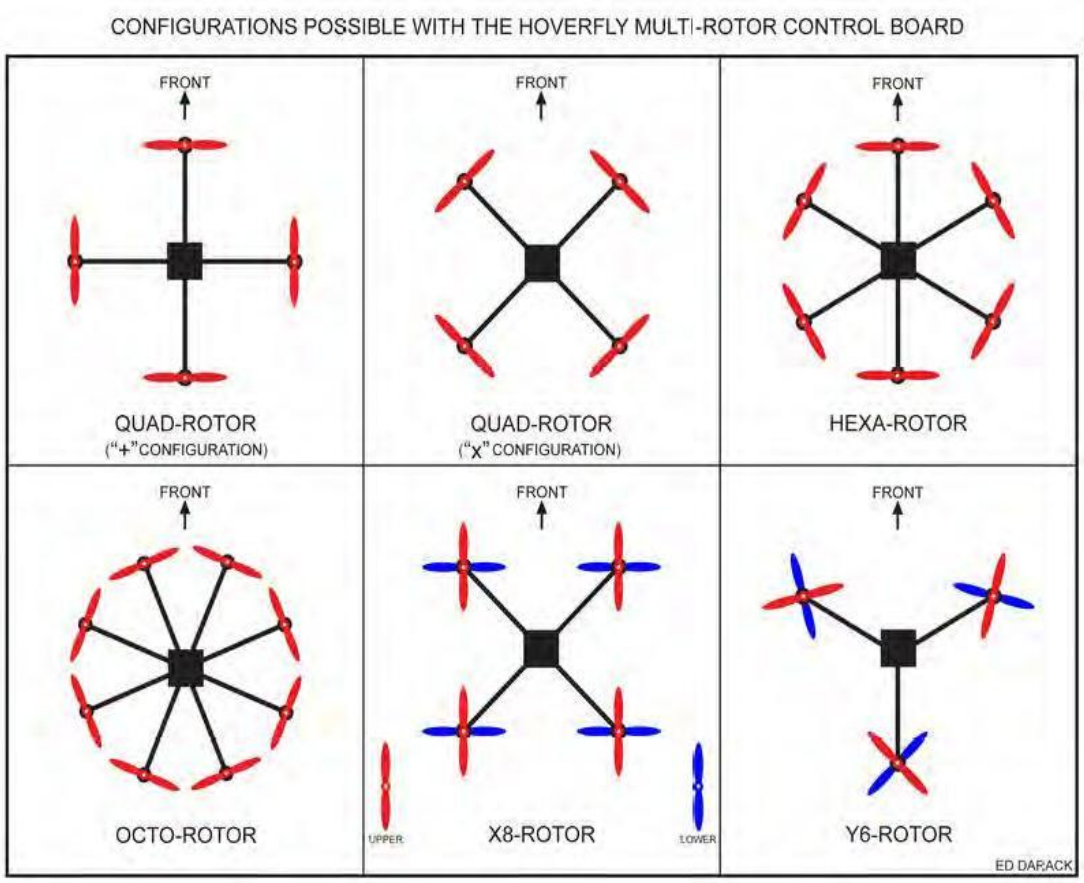

Figure 3.1 Basic Quadcopter.

IV. FUTURE SCOPE

QUADCOPTER

WY WE CHOOSE QUADCOPTER:

The quadcopter resulted in a rapid proliferation and chief to customer compare to other multirotor designs quadcopter can be desinged indoors as well as outdoors.

At a samll size quadcopter are cheaper and more durabal than other coventional helicopter due to their mechanical structure.

Their smaller blades are also advantageous beacause they possess very less kinetic energy so, they provide less damage to structure. For close interaction quadcopters are more suitable than the other ones.

Increasing the blade size result into increase of quadcopter momentum.In conventional helicopter contol becomes so difficults due to the size of singal and large propeller but in quadcopter there are four propeller so contol becomes easy and smooth.

In other multivopter or conventional helicopter consumes large space and storage requirment but in quadcopter it consumes less space.

In coventional helicopter due to the singal rotor or propeller it consumes high load, at the same time increasing blade size improve efficiency as it takes less energy to genereat thrust.

In conventional helicopter it not able to change the angle of rotor but in quadrotor it is possible to change the direction of rotor or propeller so they provide more advanced

- ✓ To equivilize the weight of the frame it requires thrust equal to the Gravity.
- ✓ To lift the drone in safe manner the thrust required is more than two times of weight of the frame.
- ✓ That thrust will be devided into each rotor of the drone.
- ✓ Suppose 1000 gm is the weight of the frame, then required thrust to equilize frame is 1000 gm.
- ✓ Then more than two times of thrust will be required to lift the drone. So, more than 2000 gm will be required.
- ✓ Taking safety factor of 20 %. So required thrusr will be
- ✓ THRUST : 2000 (1.2)= 2400 gm.
- ✓ For quadocopter thrust will be devided into forth
- ✓ 2400 / 4 = 600 gm
- ✓ So each side of the arm requires 600 gm thrust to lift the drone.
- ✓ DYS D2822/121800KV- 180 W Thrust of 640+ will be suitable for the drone. Maximum current is 16.6 A so it will need a 20 A ESC.
- ✓ ESC always required more current than motor current analogy.About 5 A more required than motor.

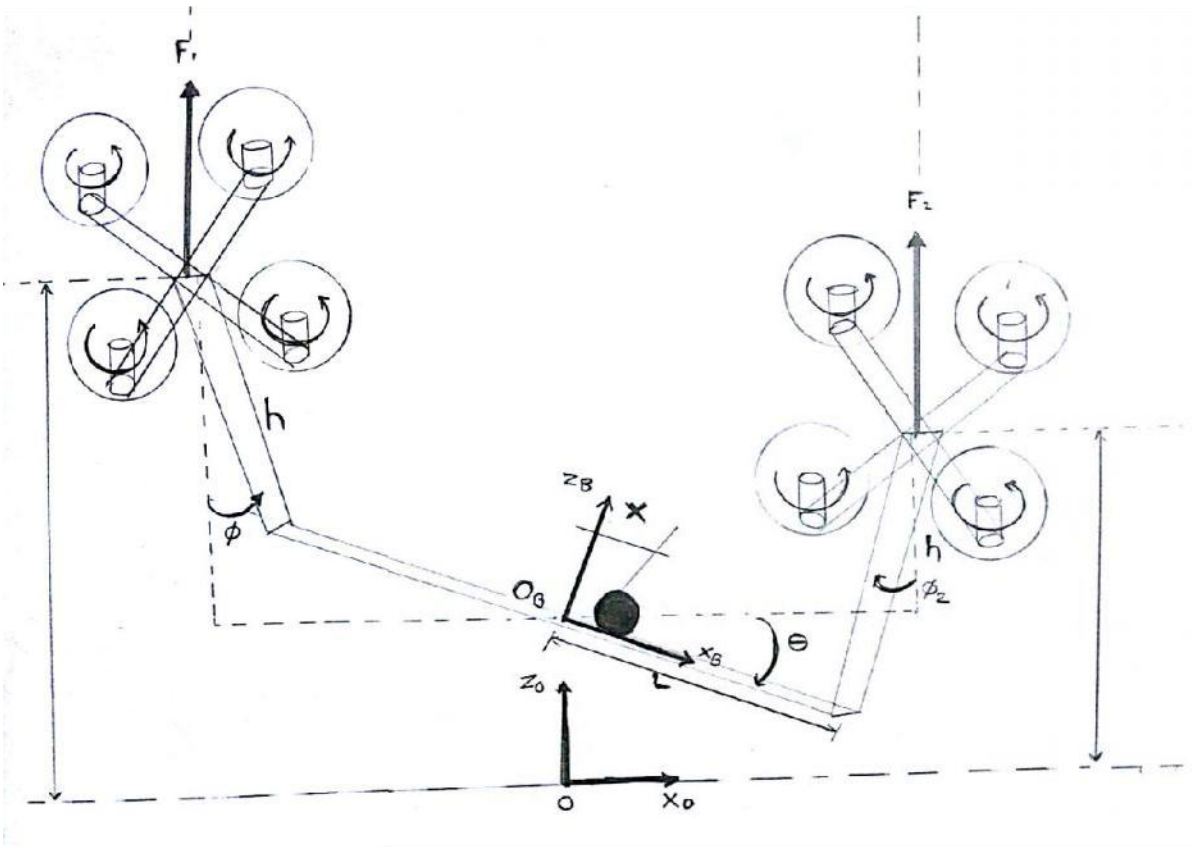

Figure 4.1 Balancing of Quadcopter.

V. FUTURE WORK AND RISK

FUTURE WORK :

- ✓ Our project to build and design of flight of quadrotor ussing RC control system. Additionally, we demonstrated limited autonomous flight as well as remote control. Future work could more focus on longer flight times, robust operation, autonomy, or mission scenarios and also smooth working ,high load carying capacity, more coverable area for work or spraying proccess.

- ✓ Longer flight time is a matter of tradeoff between two variables, the efficiency of the thrust developed by the motors and the battery capacity .Longer flight time is a matter of tradeoff between two variables, the efficiency of the thrust developed by the motors and the battery capacity .Battery capacity relates directly to weight and there are many different capacity batteries available. However, it would be possible to run an experiment to determine maximum flight time for a fixed maximum thrust by changing motors, propellers, and batteries.
- ✓ With these capabilities working then complete autonomous missions could be developed and demonstrated. Completion of these efforts would require a more stable platform and a significant amount of engineering effort but would be a very interesting follow-on activity.
- ✓ Our plan for the Quadcopter is to be able to spraying insecticides and pesticides with aditional features such as weight lifting,more speedly,time reducing,high load carrying capaciry,highly sencible,and fully remotely operated.

FUTER RISK :

- ✓ Our biggest risk factor for this project was the limited amount of time available to complete a very ambitious project. The project had to be completed by the end of the spring semester. It became apparent as we worked through this project that it would not be possible to complete all of the initial goals. An example of this risk would be failing to notice that there is insufficient battery life to safely complete a mission, resulting in the Quadcopter being in the air when all systems shut down. The Quadcopter would then fall to the ground, and most likely break.
- ✓ Other considerations included watching for weather conditions as well as altitude ceiling to prevent similar destructive results. We mitigated this risk by incorporating a real-time battery monitor into the GUI and by considering as many potential risk factors as we could think of in the procedures for flight. These included fail safes that forced the copter to auto respond appropriately, such as make a decision to land safely to the ground.

- ✓ More generally, there is the risk with any UAV of losing the control link and the load carrying capacity for lifting a fuel tank for spraying and also load of frame or body.

VI. CONCLUSION

- ✓ Our project to design and **calculation** a quadcopter for Agriculture spraying system has been a significant learning experience.We have made remarkable progress in demonstrating(prove equation) extensive. We have trie to solve many problem during our project calculation including frame design issues, thrust calculation, roll, hub and other control thrust required issues.

- ✓ The most significant thing we learned in this project is how hard it is to find and as well as understant a calculation of flying machine or else UNMANNED ARIEL VEHICLE CUM REMOTELY PILOTED

AIRCRAFT AGRICULTURE SPRAYER DRONE. Precise control must be maintained in real time over yaw, pitch, roll and altitude. This is far more complex than any other ground-based vehicle.More over airiel direction and degree of freedom is also an interesting thing to know.

VII.REFFERENCES

LITERATURE

[1]Mathematical Modelling and Parameter Identification of Quadrotor
Anezka Chovancovaa, Tomas Ficoa, Ľubos Chovaneca, Peter Hubinsky.

[2]A Brief History of Early Unmanned Aircraft- BY John F. Keane
and Stephen S. Carr.

[3]A Control Design for Quad Rotor UAVs with Input Unmodeled Dynamics. Prashanth Krishnamurthy AND Farshad Khorrami.

WEBLINK

[4] http://quadcopterarena.com/the-history-of-drones-and-quadcopters

[5] https://www.google.co.in/search?q=WHAT+IS+DRONE+WIKI&ie=utf-8&oe=utf-8&gws

RESEARCH PAPER

[6] Arduino, "Download the Arduino Software," Arduino, [Online]. Available: http://arduino.cc/en/main/software. [Accessed 6 October 2014].

[7] APM Multiplatform Autopilot, "Mission Planner Manual Table of Contents," APM Multiplatform Autopilot, [Online]. Available: http://planner.ardupilot.com/wiki/table-of- contents/. [Accessed 1 October 2014].

[8] APM Multiplatform Autopilot, "Mission Planner Installer," APM Multiplatform Autopilot, [Online]. Available: http://ardupilot.com/downloads/?did=82. [Accessed 1 October 2014].

[9]Alexis,G.Nikolakopoulos,andA.Tzes.Modelpredictivequadrotorcontrol:attitude,altitudeandpositionexperimentalstudies.IETControlTheory&Applications,6(12):1812– 1827,Aug.2012

[10].Das,K.Subbarao,andF.Lewis.Dynamicinversionwithzerodynamicsstabilisationforquadrotorcontrol.IETControl Theory&Applications,3(3):303–314,March2009

[11]deVriesandK.Subbarao.Backsteppingbasednestedmultiloopcontrollawsforaquadrotor.InProc.oftheInternational Con- ferenceonControlAutomationRobotics&Vision(ICARCV),pages1911–1916,Dec.2010

