

Analysis and Control of Quadcopter System

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Abstract—Quadcopters are widely used in different applications. Modeling and control of the quadcopter are challenging due to its highly nonlinear dynamics. This paper covers the analysis and the stability of the nonlinear system of quadcopters using Lyapunov stability criteria. In addition to that, the controller is designed to track the desired position and orientation. The proposed control method is tested on both simulation and hardware and results are analyzed using MATLAB/Simulink.

Index Terms—Quadcopters, Quadrotors, Lyapunov stability, nonlinear, control

II. MODELING

III. CONTROL DESIGN

IV. SIMULATION AND RESULTS

V. HARDWARE IMPLEMENTATION AND RESULTS

VI. CONCLUSION

REFERENCES

I. INTRODUCTION

Quadcopters, also known as quadrotors are one of the examples for aerial vehicles, which operate with four rotors. Moreover, they are used in a wide area of applications like aerial photography and surveillance, making them useful in the area of search, rescue and environmental monitoring. In addition, they can be used in delivery services for small packages, especially in remote and congested areas.

In order to discuss the study outcomes, the remainder of the paper is organized as follows: section II presents the dynamic model and Lyapunov stability analysis. The controller design is discussed through section III, section IV includes the results of the conducted simulations. Hardware implementation and results are illustrated through section V. Finally, section VI summarizes the conducted work and recommends future endeavors of this study.



Fig. 1: Quadcopter Applications