ABSTRACT

Preliminary Analysis of Stability and Control of A Quadcopter
Under Gun-Shock Loading

by

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In this thesis, the problem of stability and control of a quadcopter under gun-shock loading was preliminary studied. The gun-shock loading was due to a firing gun mounted on the quadcopter and approximated as an impulse. At first, A CAD model of quadcopter mounted with a gun was developed to obtain a reliable estimate of inertia properties and built the simulation model using XCOS/SCILAB. This thesis used the DJI Phantom 2 Vision and Pistol P-3A Kal.7.65 as the base model of the quadcopter and the mounted gun. Here, we considered the single impulse working on the point of action of the impulse was in the z-directional axis of the quadcopter. Hence angular momentum by the impulse was only in the pitch and roll directions. Moreover, this thesis also reports an attempt to implement PID control on the non-linear dynamics of the quadcopter under the gun-shock loading. In this thesis, the PID control tuning was divided into three methods. The first tuning method was manual PD tuning (trial and error). The second tuning was the PID tuning with the Ziegler Nichols method. And the third tuning was the Ziegler Nichols method with manual tuning. The PD tuning method had the best rise time and settling time, but the Ziegler Nichols with manual tuning had the best steady-state error, and it was the closest to the initial condition after the gun was fired.
Keyword: *quadcopter, stability, control, PID, gun-shock*