

Modeling of a Small Unmanned Aerial Vehicle

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Abstract : Unmanned Aircraft Systems (UAS) are playing increasingly prominent roles in defense programs and defense strategies around the world. Technology advancements have enabled the development of it to do many excellent jobs as reconnaissance, surveillance, battle fighters, and communications relays. Simulating a small unmanned aerial vehicle (SUAV) dynamics and analyzing its behavior at the preflight stage is too important and more efficient. The first step in the UAV design is the mathematical modeling of the nonlinear equations of motion. In this paper, a survey with a standard method to obtain the full non-linear equations of motion is utilized, and then the linearization of the equations according to a steady state flight condition (trimming) is derived. This modeling technique is applied to an Ultrastick-25e fixed wing UAV to obtain the valued linear longitudinal and lateral models. At the end, the model is checked by matching between the behavior of the states of the non-linear UAV and the resulted linear model with doublet at the control surfaces.

Keywords : UAV, equations of motion, modeling, linearization

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