Andres Perez et al., J Aeronaut Aerospace Eng 2014, 3:2
http://dx.doi.org/10.4172/2168-9792.S1.002

OMICS Group Conferences
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2nd International Conference and Exhibition on
Mechanical & Aerospace Engineering
September 08-10, 2014 Hilton Philadelphia Airport, USA

Low cost autopilot system for an autonomous unmanned aerial system

Andres Perez, Israel Moguel, Hever Moncayo and **May Chong Chan**
Embry-Riddle Aeronautical University, USA

In this paper, a low cost sensor and autopilot solution that uses a non-linear Kalman Filter combined with a complementary filter to estimate the attitude of a small Unmanned Aerial System (UAS) is presented. A full six degree of freedom non-linear model of the UAS was first developed in a Matlab/Simulink simulation environment to design the guidance and control law algorithms. Parameter identification techniques using real flight test data were implemented to optimize and validate the initial aerodynamic model. The control laws are primary based on a Linear Quadratic Regulator (LQR) state feedback applied to both the inner and outer loops of the longitudinal and lateral dynamics of the aerial system. The guidance logic allows tracking of virtual waypoints previously defined by the user. The proposed system configuration was successfully tested within a flight test program at Embry-Riddle Aeronautical University aimed at investigating and implementing UAS low cost technologies for research and education. During a single flight, the UAS was able to follow twenty nine consecutive waypoints within a maximum error of fifteen meters of radius under fully autonomous flight.

Biography

Andres Perez completed his Bachelor's degree in Mechanical Engineering from Universidad de los Andes of Bogota Colombia in 2010. He achieved his Master in Science degree on Mechanical Engineering from the same University in the year 2012 with an honor mention. Currently he is a PhD student at Embry Riddle Aeronautical University and has been working on the on the area of Guidance Navigation and Control for more than three years in projects related to the military industry.