1998

RESEARCH ON AUTONOMOUS AIR VEHICLES

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Department of Aeronautics and Astronautics
Sponsor: Naval Postgraduate School

OBJECTIVE: To investigate autonomous operation of fixed and rotary wing aircraft.

SUMMARY: A small avionics package was developed, installed and verified on a Bergen Industrial Helicopter. The avionics development included the design of an ultrasonic altimeter and mounting of a three-axis accelerometer. A small data logger based on a Motorola MC68332 processor was used to collect sensor data. A control program for the data logger was developed using the C programming language. The operation of the avionics package was validated through ground and flight testing. Concurrently with the development of the avionics package, a dynamic model of the helicopter was developed using aerodynamic parameterization and linear state-space modeling techniques. The Naval Postgraduate School designed JANRAD software was utilized to obtain the stability and control derivatives. The fidelity of the simulation model was verified by comparing the simulation responses with data collected from the avionics sensors during flight tests.

VIRTUAL PROTOTYPING OF AVIONICS SYSTEMS

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Sponsor: NAVAIR

OBJECTIVE: To analyze tools to develop system-level prototypes of avionics systems. These prototypes will be used for architecture design, to perform regression testing, identify problems, discover solutions and assess the value of potential upgrades.

SUMMARY: A survey of tools for use in the design and simulation-based acquisition of avionics systems was performed. A tool for avionics system architecture design was selected and studied. A set of CAD tools developed by CPU Technology, Inc. was examined. These tools offer unique benefits for legacy avionics problems. Efforts were begun to incorporate these tools into classes within the Department of Aeronautics and Astronautics. Tools useful for requirements design were identified and incorporated into a class on Avionics Software Engineering. Additional research was performed in cooperation with the International Council on Systems Engineering (INCOSE) Model Driven System Design Working Group. This work included the identification of issues related to the characterization of model driven system design and identification of transition strategies from present document driven approaches.

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OBJECTIVE: To investigate autonomous operation of fixed and rotary wing aircraft.

SUMMARY: Work has been performed to develop a small autonomous rotary-wing vehicle. The vehicle and a subset of the eventual avionics suite have been purchased and integration of the avionics suite has begun. The vehicle will carry a sensor suite including inertial, GPS, vision and ultrasonic sensors. Data from these sensors is transmitted to a ground-based control station where the processing and autonomous control functions reside. Control signals are transmitted from the ground station to the air vehicle. The vehicle will support research into autonomous control, vision-based navigation, and the use of passive sensors to land VTOL aircraft on ships.

RESEARCH ON AUTONOMOUS AIR VEHICLES

Russell Duren, Associate Professor
Department of Aeronautical and Astronautical Engineering
Sponsor: NPS Research Initiation Program

OBJECTIVE: The objective of this project is to investigate autonomous operation of fixed-wing and rotary-wing aircraft.

SUMMARY: Funding was received and work began on this project during the final quarter of calendar year 1996. During this quarter potential missions for rotary-wing UAV's were identified and/or further defined. One mission is a joint program in which a rotary-wing UAV is used to assist a ground based vehicles in the detection, location and disposal of mines and unexploded ordinance. A survey of existing rotary-wing platforms available in the department's UAV lab revealed the need for an intermediate sized platform for initial research. Specifications for such a platform were developed and submitted to purchasing.