CompAir - A Windows™ Based Interface for a Radio Controlled Airplane

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ABSTRACT

The purpose of this project was to evaluate the feasibility of using an off-the-shelf radio controlled model airplane, along with commercially available components, to develop a platform for future robotic command and control operations. Specifically, we needed the hardware and software to allow a laptop computer to send control instructions to an airplane. We developed a micro controller interface between the laptop's printer port and a standard model radio transmitter. Then we developed an interactive software package that issues preprogrammed command "scripts" to the airplane.

BACKGROUND

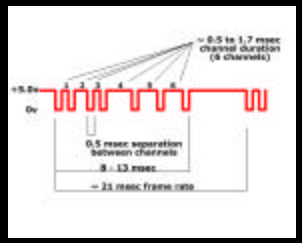
Unmanned Aerial Vehicles seem to have two extremes:

•Operator Controlled – This category includes aircraft which require highly trained operators and full time attention during the mission. The most recognized is the Predator, used in Afghanistan and Iraq, which cost millions of dollars.

•Autonomous – These aircraft make extensive use of on-board computers to carry out a specific task without operator intervention. UAV's in this category are still in the research phase.

HARDWARE INTERFACE

A microprocessor interface is needed to translate the settings of the 8 data pins in the computer's printer port into a pulse width modulated (PWM) signal for input into the radio transmitter. The PIC16C54 from Microchip™ was suitable for this task.



SOFTWARE INTERFACE

The Graphical User Interface was executed in Microsoft™ Visual Basic, version 6.0. The interface consists of the following modules:

PORT TEST –
This module verifies that the program has access to the printer port. It also allows the programmer to debug the hardware interfaces.

TRIM / EPA –
This module allows the operator to adjust trim settings to achieve a straight and level flight attitude. The EPA (End Point Adjustment) functions allow the system to be adjusted to attain the proper amount of flight control surface deflection.

CALIBRATION –
This module allows maneuvers to be timed.

FLY –
This module uses simple button controls to initiate compound maneuvers.

FLIGHT PLAN (future) –
This module will allow the user to create macros to chain together various simple control instructions into complex maneuvers.

RESULTS AND FUTURE WORK

The system has successfully controlled the model airplane through a series of basic maneuvers (i.e. turn left, turn right, climb, descend.) These basic maneuvers have been successfully chained together to execute flying a rectangular course.

However, there is significant variance in the repeatability of these maneuvers. The absence of position and heading information from the airplane mandates that all maneuvers be executed based on finite time. Future work will incorporate this needed feedback from the airplane, either from on-board GPS and/or directional and airspeed instrumentation.