

Architecture for Harmonizing Manual and Automatic Flight Controls

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Automatic flight control systems occasionally confuse pilots. A pilot should shift to manual control if necessary in an emergency situation. However, it is often difficult for a pilot to make a decision to disengage the autopilot. Against this background, we propose the “human as a control module” architecture for harmonizing pilot and autopilot control. The human as a control module architecture adjusts pilot and autopilot control authorities automatically when simultaneous inputs to the aircraft are given. Avoiding the overlap of pilot and autopilot inputs, the proposed architecture helps to circumvent the effect of conflicting actions. This paper culminates in the ultimate purpose of the human as a control module architecture and demonstrates how it could improve aircraft safety by applying it to a past aircraft incident.

Nomenclature

E	error index
i	number of modules
j	number of outputs
m	number of time steps of past tracking errors
n	number of time steps at the present time
r	target value
t, t_n	present time
u	input vector to aircraft from the ARBITER module
V	airspeed
V_{mo}	maximum limitation of airspeed
x	input vector from each module
y	simulated output vector corresponding to each module
z	vector of modification signal

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