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Cognitively Tailored Interfaces (CTIs) for Unmanned Aerial Vehicles (UAVs)

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Overview

Current UAV operator interfaces are function-centered which can hinder operator efficiency and effectiveness. This research focuses on improving those interfaces through CTIs. CTIs match an individual's style of thinking to an interface design along two axes: wholistic-analytic and verbal-imagery. Nineteen participants' (Figure 3) cognitive styles were assessed through the Extended Cognitive Styles Analysis Test (ESCA) and categorized as analytic, wholistic, or hybrid. Participants then completed a survey using three CTIs (Figure 2). Results supported the hypothesis that individuals preferred interfaces tailored to their cognitive style preference.

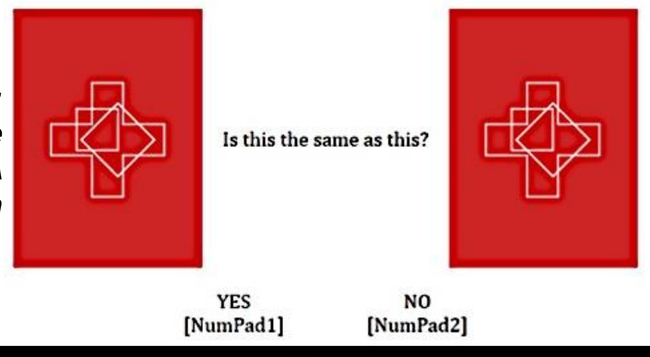


Figure 1: Example ECSA question

Demographics			
Gender	Male: 14 (74%)	Class Standing:	Senior: 18 (95%)
	Female: 5 (26%)		Junior: 1 (5%)
Age	Range: 20-32	Major:	EE: 7 (37%)
	Average: 24.2		ISE: 5 (26%)
Race	Caucasian: 18 (95%)		CPE/CS: 6 (32%)
	African American: 1 (5%)		Unspecified Engineering: 1 (5%)

Figure 3: Demographics

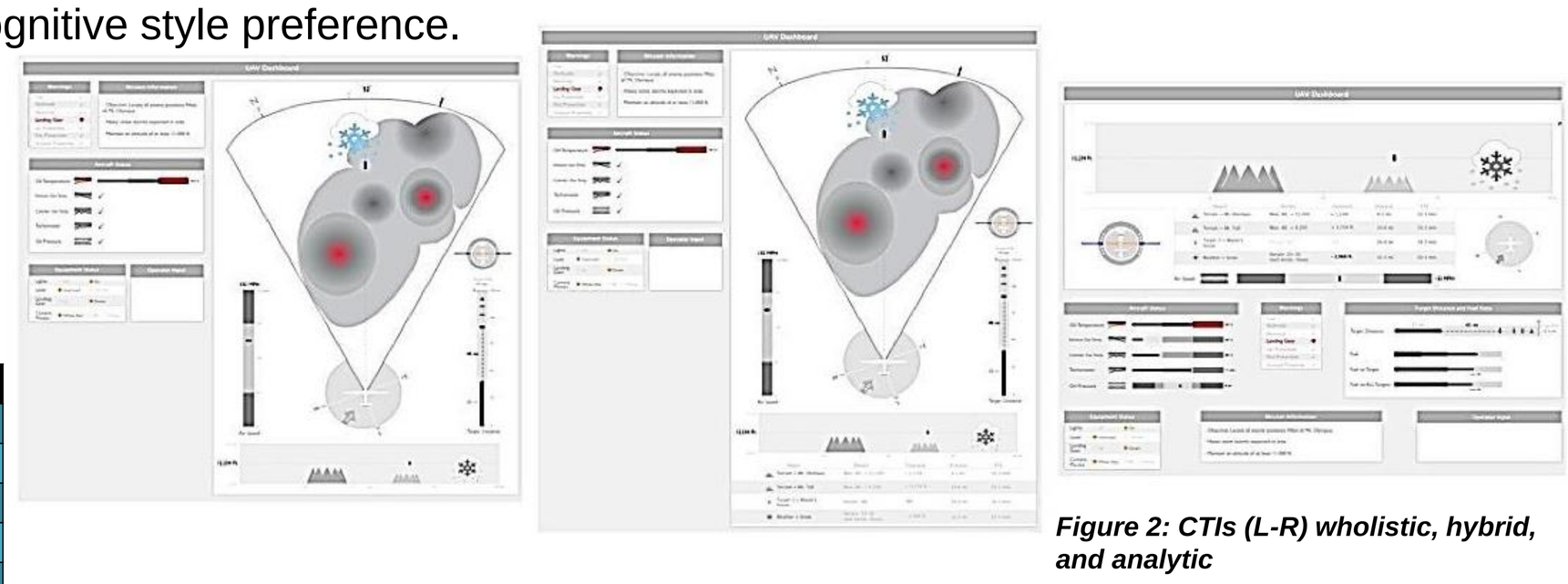


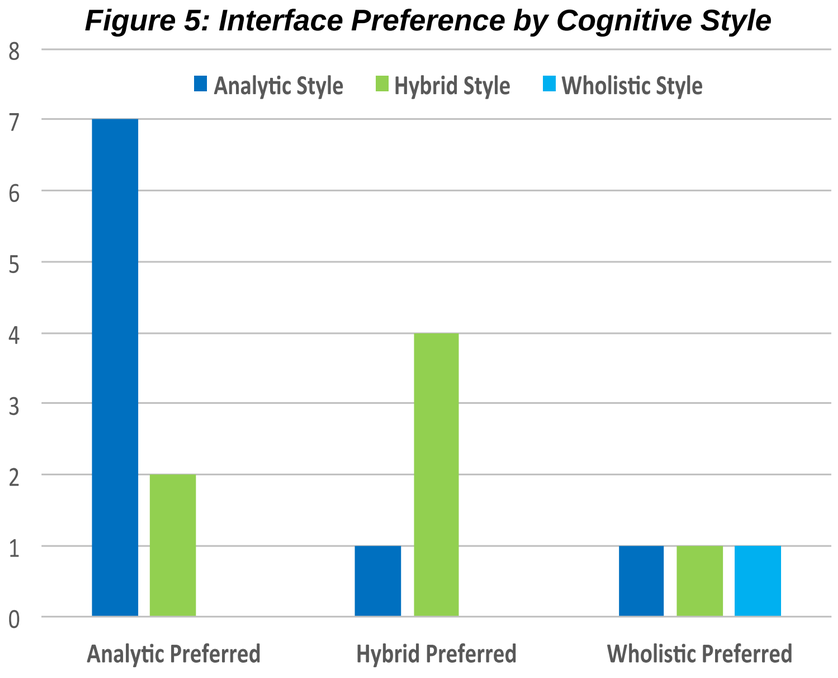
Figure 2: CTIs (L-R) wholistic, hybrid, and analytic

Key Findings

Eye tracking data (Figure 4) was collected to reveal where a participant's eyes focused on the screen. This data was then compared to the participant's ECSA score. The hypothesis that participants would preferred the CTI that matched their ECSA preference was supported through the comparison of the eye tracking data to their ESCA preference score (Figures 5 and 6).

Figure 4: Heat map of eye tracking data

Figure 5: Interface Preference by Cognitive Style



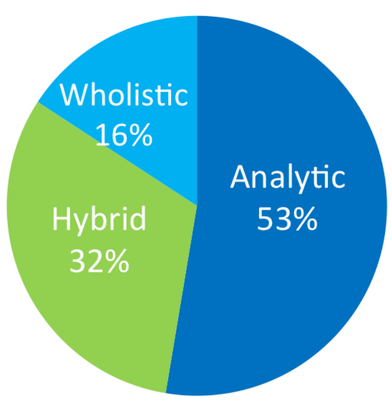


Figure 6: Participants' cognitive styles

Explanation

This research pertains to the American Astronomical Society through its support of the transition from one-size-fits-all function-centered systems to individually tailored human-centered systems. The efficiency and effectiveness of the operator of the current system (Figure 7) is hindered by the extraneous information contained in the multiple windows. Each interface in Figure 2 eliminates extraneous information. The findings of this research can be applied to any autonomous system interface, such as a planetary rover or other exploratory vehicle.

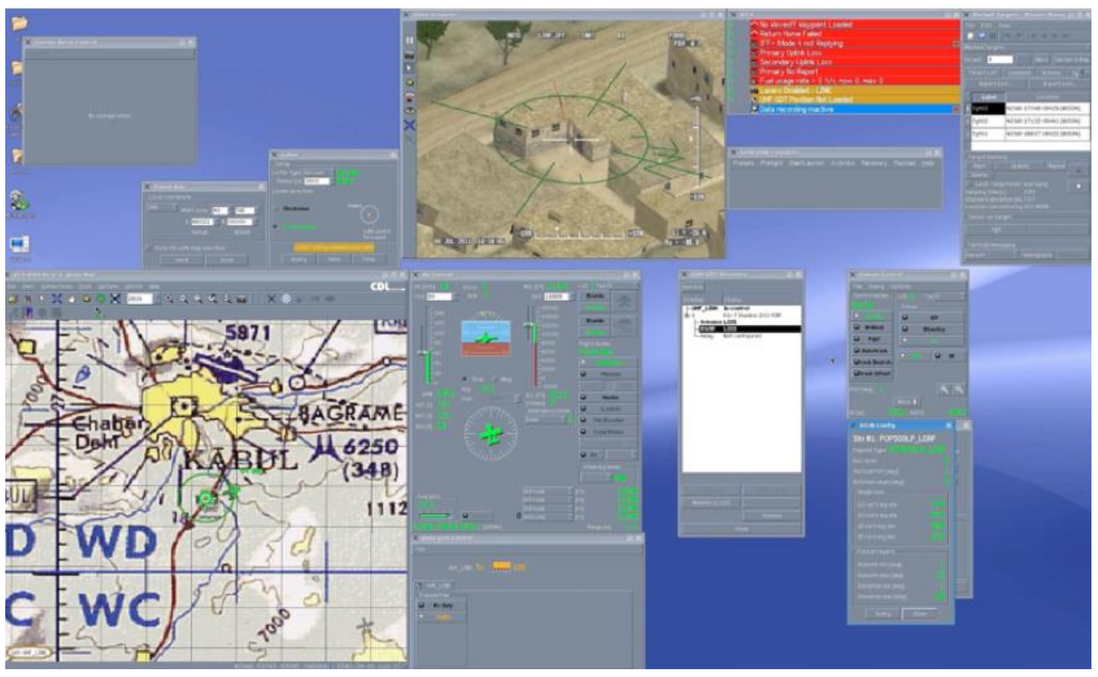


Figure 7: Current UAV interface

Impact

This research improves the usability of UAVs, or autonomous vehicles in general, while allowing multiple disciplines to work together to achieve a human-centered system to pave the way for future CTIs.

Acknowledgements

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