SCAN-PATH ANALYSIS OF AIR TRAFFIC CONTROL DISPLAYS

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Purpose: Air traffic control displays are densely packed with information intended to provide the controller with a 3-dimensional representation of traffic within a volume of airspace. In order to create more effective display formats, it is desirable to develop a model of information acquisition and cognition which describes the behavior of controllers. **Methods:** Subjects viewed simulated air-traffic displays containing a "conflict pair," a pair of aircraft on a collision course, as well as other aircraft. The task was to locate and identify the conflict pair. The primary independent variables were number of aircraft, and whether or not color-coding was used to augment text in the depiction of altitude. Previous behavioral studies have shown that detection of conflicts is speeded by using color for redundant coding of altitude information. Eye fixation scan-paths were monitored using a head-mounted video camera system, a digital video recording system, and image analysis software. Statistics of empirical scan-path data were compared with those of synthetic scan-paths generated by a computer model. The model had implicit knowledge of target locations colors. Additional information, such as aircraft symbol orientation (indicating the direction of flight) and text "data block" contents required fixation in the neighborhood of the item in question. The model detected conflicts after sufficient information had been acquired and remembered. Adjustable parameters of the model included the size of the attentional "fovea," rates of forgetting, and a selection of heuristic refixation strategies. **Results:** The model is able to capture basic features of the data, such as the average number of fixations required to locate the conflict. At present, the model's simple refixation strategies have not been adequate to model higher-order sequential dependencies, but we hope that this will be resolved by more sophisticated geometrical reasoning. **Conclusions:** Scan-path analysis is a powerful tool for revealing the sequential access of information in complex displays and its retention in memory.

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