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Authors

Freed, Michael

Remington, Roger W.

Johnston, James C.

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Using Simulation to Predict Human Habit-capture Errors

Michael Freed, Roger W. Remington, James C. Johnston
NASA Ames Research Center

We are constructing a system to predict the kinds of errors air traffic controllers are likely to make using given procedures and equipment. The system takes procedure and equipment descriptions as input. Output is produced in two phases. In the simulation phase, the simulated controller carries out tasks in a set of user-defined scenarios. In the subsequent analysis phase, occurrences of operator error are identified in a trace of simulation events; detected errors are then classified as instances of error types, represented as *error-patterns*.

The primary assumptions about human cognitive behavior are defined by a domain-independent cognitive model. Using the current model, the simulation phase can reproduce several classes of human error, including what are sometimes called "habit capture errors." An everyday example of a habit capture error occurs when driving to an unusual destination along a familiar path. For example, a person may drive away from work intending to stop at a convenience store along the way, but inadvertently arrive at home (the usual destination) instead. Analogous errors can occur in the domain of air traffic control.

A habit capture error can be defined as the selection of habitual (high frequency) action when information that implies that the action is inconsistent with current goals can be recalled from memory or perceived. Habit capture errors are predictable in the sense that certain known factors greatly influence the likelihood of their occurrence. The likelihood of such an error rises when any of the following conditions exist:

- At the moment of decision, no easily perceived feature marked a conflict between a habitual action and current goals
- At some time prior to making a decision, an easily perceived feature marking conflict between habit and goals was insufficiently encoded in memory due to high workload
- During the interval between perceiving conflict information and using that information in a decision, the agent rarely observes reminders of the information
- The agent must cope with high workload at the moment of decision, reducing the time available to recall habit counterindicative information from memory

Our simulated human agent is designed to carry out tasks in complex, dynamic domains, performing competently under normal conditions, but becoming increasingly likely to err when factors such as those listed above are present. The current model approximates human proneness to several

different kinds of habit capture error. Future elaborations of the model will produce error susceptibilities of other kinds.

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