Dynamic Human Reliability Analysis models like HUNTER (Human Unimodel for Nuclear Technology to Enhance Reliability) use contextual factors to model human performance. The HUNTER virtual operator can be integrated with plant simulators to model human-in-the-loop performance.

The HUNTER virtual operator can follow procedures and interact with a plant by reading indicaitons and performing plant actions. This allows HUNTER to examine the state of the plant and evaluate the correct procedure path from the available information. HUNTER is a monte-carlo simulator that conducts a set of stochastic runs to assess human performance and plant states with to specific scenarios such as starting up a plant or mitigating a plant failure.

GOMS sub-tasks for actions, checking, retrieval, instruction communication, selection, and decision making. The action, checking, retrieval, and selection sub-tasks are further segregated based on whether they occur in the field or in the control room. The decision task can be specified as being guided by procedures, or without procedures. Each of the GOMS 12 sub-tasks has a temporal distribution associated with it. The HUNTER model allows for normal, lognormal, and exponential distributions. For each of the sub-tasks parameters have been specified from fits to empirically collected with licensed operators.

Operator task times are further parameterized by a fatigue time multiplier that accounts for circadian factors and time on shift. From examining normal and abnormal scenarios we have observed that licensed operators can operate at an expedited pace or a nominal pace dependent on context. To account for this variability a time pressure factor can be applied by scenario. When HUNTER is integrated with a plant simulator the plant dynamics also influence timing.

In addition to modeling time and system dynamics, HUNTER accounts for operator reliability by mapping performance shaping factors (PSFs) to GOMS sub-task primitives. Some of the PSFs have *static* human error probability parameters and some have *dynamic* human error probability factors.

Calibration

* Use with no calibration
* Simulate over a wide range of parameters and post-hoc determine which parameters are sensitive and discover thresholds that lead to plant failure.

HUNTER has a variety of potential applications. HUNTER has been coarsely calibrated to licensed operators interacting with the Rancor Microworld Nuclear Power Plant during normal and abnormal scenarios. HUNTER could be utilized

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