

Going to Mars: Automating Off-World Operations and On-Earth Launch Preparations

Stottler Henke is developing, for NASA's immediate and far-future use, a general framework to automate planning, scheduling, and execution decision-making. The framework is first being applied to automate those cognitive processes for the launch preparations for the Space Launch System (SLS) and Orion deep space manned spacecraft, both systems referred to by NASA Administrator Charles Bolden, when he said, "We're on our way to Mars ... we're building a rocket that's going to take humans to Mars." The framework integrates automatic diagnostic planning, scheduling, and adaptive execution systems to create a fully automatic, closed-loop, autonomously executing software system.



Boeing 787 Dreamliner™ Assembly Scheduling

The Boeing Company contracted with Stottler Henke to tailor our Aurora intelligent scheduling software specifically to help manage the process of building the Boeing 787 Dreamliner™ commercial airliner. Aurora is a sophisticated scheduling system that combines a variety of scheduling techniques, intelligent conflict resolution, and decision support. The software's scheduling decisions take into account resource requirements, a variety of constraints, and any pertinent

domain knowledge. Aurora's analytic capabilities help the scheduling team understand why the software scheduled the way it did, so the team can focus on those parts of the production plan that could result in schedule cycle improvement if streamlined. The Aurora version for Boeing prioritizes factory production tasks by balancing resource capacities with manufacturing requirements and constraints. The result is a dynamic assembly schedule that adapts to real-time production variability. Boeing is also applying the Aurora-based scheduler to other production lines.

Intelligent Tutoring Systems for training IT Professionals (ITADS)

An increasingly digital Navy relies on a large staff of IT professionals and systems administrators to keep their complex IT systems running effectively and efficiently. These systems and the professionals who install and maintain them are critical to the success of missions. The Navy is committed to providing its IT corps the best training and this is manifest in the IT school run by the Center for Information Dominance that trains thousands of Navy officers and enlisted staff every year. Recently, the school has perceived a gap in their curriculum; trainees are not getting sufficient hands-on experience with the types of IT issues and trouble tickets that arise in the fleet. They have limited opportunities with hands-on labs. The ITADS system is being developed to fill this gap. The prime focus of ITADS will be an Intelligent Tutoring System to provide a problem-based learning experience using simulated labs. The simulated problems will be designed to be a realistic representation of the challenges faced by IT personnel in the fleet and include the tools and technologies used therein. The ITS will automatically monitor and assess problem-solving performance and build student models to help adapt instruction to individual skill and expertise profiles. The ITADS system will include an authoring framework to allow the end user organization to create/modify the ITS content.



MIDAS: Managed Intelligent Deconfliction & Scheduling for Satellite Communications

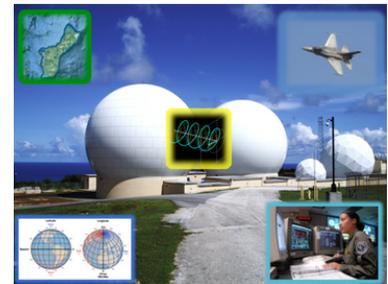


The Air Force Satellite Control Network (AFSCN) coordinates hundreds of satellite communication requests from various users every day. MIDAS is a tool for rapidly scheduling and deconflicting AFSCN satellite communication requests. In the past, these needs were met by teams of highly trained and experienced schedulers manually checking every schedule request received. Approximately half of all requests require adjustment to remove conflicts. MIDAS automates much of this, allowing schedulers to apply their expertise where it is really needed. MIDAS employs a two-stage process that first shuffles tasks within their defined

constraints before carefully applying a user-definable set of business rules that allow certain constraints to be relaxed when necessary. The system provides a familiar, user-friendly interface, runs on inexpensive consumer hardware, and communicates with legacy systems via a well-defined plain-text file format. *This material is based upon work supported by the United States Air Force under Contract No. FA9453-12-C-0066. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Air Force.*

AI-based, Automated, EMI Emitter Localization and Identification System

Stottler Henke's TRACER system investigates suspected terrestrial sources of electro magnetic interference (EMI), presents an intuitive description and classification of each EMI incursion and its current impact on operations, and recommends which steps should be taken to mitigate the interference. This tool rapidly and continuously updates the probabilities of various possible sources of EMI. To detect EMI, TRACER monitors signals from antennas around the world. Upon first confirming or excluding the presence of space-based sources of interference, TRACER—based on details of the signal such as its classification, direction, and strength—retrieves and implements one or more investigative methodology cases. *This material is based upon work supported by the United States Air Force under Contract No. FA9453-16-C-0495. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Air Force.*



RapID: An Immersive Approach to Intuitive Information Processing and Decision Making

Intuitive decision making is aligned with automatic and unconscious mental processing. Not only are intuitive decisions made quicker, but research indicates that in some contexts, the maker of intuitive decisions consistently arrives at better decisions than those produced through analytical decision-making approaches. RapID employs an inexpensive, commercial-off-the-shelf psychophysical eye gaze tracking system and novel visual cuing strategies to draw the attention of trainees to the cues that are most essential to understanding situations encountered in immersive training environments. RapID automatically analyzes the eye gaze pattern data of the most highly proficient players and then uses this data to implicitly encourage less skilled players to attend to the most informative cues in the environment. RapID simplifies the learning problem by subtly revealing “what experts would attend to” in like situations, and, by utilizing implicit cueing (rather than explicit instruction), RapID builds the foundation of experience that supports intuitive decision making. *This material is based upon work supported by the U.S. Navy under Contract No. N00014-14-C-0025. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the U.S. Navy.*

