

Innovation in Intelligent Autonomy

SoarTech is excited and proud to be participating with Team Michigan in its efforts to extend the state of the art in team robotics as part of the International MAGIC robot competition. SoarTech is a world leader in realistic, mission aware autonomy including systems that can plan and execute tactically correct actions, adapt to changing situations in real-time, and interact with humans in natural ways.

Situation, Actions, Goals, Environment (SAGE) Interface

An autonomous system not only must be able to make correct decisions, it must also provide human operators and users with the information they require to direct and, when necessary, take control of the system. SAGE provides this interface for Team Michigan's MAGIC team operators and judges.

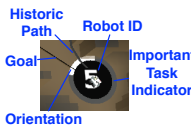
- It provides a comprehensive view of the robot team that highlights key information without overwhelming the operator with details.
- It automatically adjusts the user's view to allow the operator to attend to the information in the display and not the control of the interface itself.
- It detects and prioritizes events across the entire team of robots and ensures that the operator is provided with information on high-priority events.
- It provides a prioritized contextual view of key events, including potentially disastrous events to allow the operator to quickly make critical decisions

The God's Eye View (GEV)

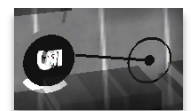
The GEV is SAGE's main view and it is designed to be simple, yet provide the operator with all of the information needed to monitor the robot team at a glance and understand when interaction is required.



The GEV automatically changes the view position to keep all robots in view at the same time



Markers provide a rich source of information (position, id, orientation), no matter how big the region.



Subtle animations indicate tasks.



Desaturated colors let the important things stand out – dangerous OOIs, robots doing important tasks



Like a real time strategy game, unexplored territory is displayed as dark shaded regions providing instant assessment of unknown areas



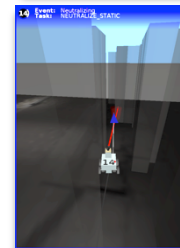
Wall "anti-aliasing" is used to address uncertainty in wall positions – more uncertainty is more transparent

Event Detection and First Person View (FPV)

SAGE wouldn't be a SoarTech system without some intelligence behind it. Underneath the cool 3D graphics lies a reasoning system that monitors the robots and the world they are exploring and automatically detects events that the operator will care about.



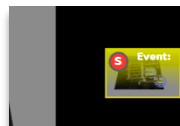
A civilian too close to a dangerous OOI? No problem, the reasoning system detects this and alerts the user with a new bright red display window and even a spoken warning.



An operator needs to see more details during important activities like neutralizing dangerous OOIs. The reasoning system handles this too providing a first person view on the event so the operator can see from the perspective of the robot.



Robots, like humans, make mistakes, and the event system accounts for this. It monitors what the robots are reporting and does its best to eliminate duplicate reports and false positives so the operator is not distracted from important tasks.



SAGE does this with the operator totally hands-off. SAGE automatically configures windows to provide the most important information at the top while removing outdated information.

Modeling human reasoning. Enhancing human performance.

Since 1998, Soar Technology, Inc. (SoarTech) has been studying and building software that models human behavior and reasoning, creating software that “thinks the way people think;” constantly learning, getting smarter, and adapting to new times and situations.

Our work is rooted in a deep understanding of human perception, memory, performance, learning, and emotion. To this we add a careful analysis of domain knowledge, built into our systems so they work the way you work. All our software exists to help humans learn, think, and work better. We engineer our systems with the most natural and adaptable user interfaces possible so that the machine supports the human, not vice versa.

The Soar Cognitive Architecture contains general computational mechanisms that can be ‘programmed’ to perform a specific kind of POP planning via the addition of knowledge. What separates it from other general purpose languages is that its mechanisms and primitives are designed to support behavior generation, and thus it provides a more useful abstraction of the underlying machine for behavior development. While SoarTech uses many different agent architectures, depending on the problem, Soar is often what underlies our ‘knowledge-rich’ approach to agent development.

SoarTech’s strong research history is apparent in the expertise of its staff, many who have studied and worked at premier universities and research institutes including the University of Michigan, Carnegie Mellon University, and the University of California. Nearly all have managed or acted as principal investigator on multi-million dollar applied research contracts for the US and foreign medical, military, and intelligence communities.

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MAGIC 2010: Situation, Actions, Goals, Environment (SAGE) Interface



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