

# **Cognitive Architecture for Situation Awareness (CASA)**

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In this presentation we discuss some of the issues of modeling situation awareness (SA) in dynamic decision-making environments. SA consists of three levels: perceiving objects, understanding the situation, and making predictions about the situation. This is an ongoing project that has the goal of modeling the SA of Army commanders during battlefield operations. Specifically CASA models a battlefield commander interacting with a military scenario running in OTBSAF. The commander (human/CASA) receives a mission and assigns tasks to the friendly units in order to achieve the goal. The commander monitors the battle field during the simulation to correct or change the entities' plans based on the mission progress. In order to change or correct plans of the friendly forces the commander must be aware of the situation. So far, we have implemented CASA at the perceptual level of SA. CASA interacts with the simulation in real time to obtain information concerning the entities' states. The information is received from intelligent agents, however, the information they provide can be incomplete or fallible. In addition to the information errors, CASA models memory failures of commanders when dealing with information concerning many entities and their status. CASA multitasks and includes attention-sharing mechanisms to switch the commander's attention based on current environment conditions.

We are using the SAGAT technique to measure the SA of the experimental subjects and CASA. SAGAT interrupts the task to ask questions to CASA, which then runs the necessary productions to answer the questions. The SAGAT questions are at level one SA (i.e., the perceptual level) in the current state of the CASA prototype. There are many technical problems to overcome in order to build a more realistic model of SA in dynamic decision-making tasks. In the current prototype we have oversimplified the spatial and temporal reasoning requirements of the task. Also, the state representation becomes progressively more complex and more difficult to implement with the addition of each entity and each task. Also, several difficult, but necessary task variables have yet to be implemented (e.g., terrain conditions and weather conditions). There are still many cognitive mechanisms to implement (e.g., evaluation of plan progress, threat assessment, and assessing opposition entities as well as their plans). Implementing how commanders come to understand situations with partially known states and predict future states will be difficult. Finally, the implementation of the commander's ability to recognize the plan of opposition forces will prove to be particularly challenging. The ultimate goal of the project is to determine whether SA can be learned, and, if so, can we develop models of SA learning at all three levels?