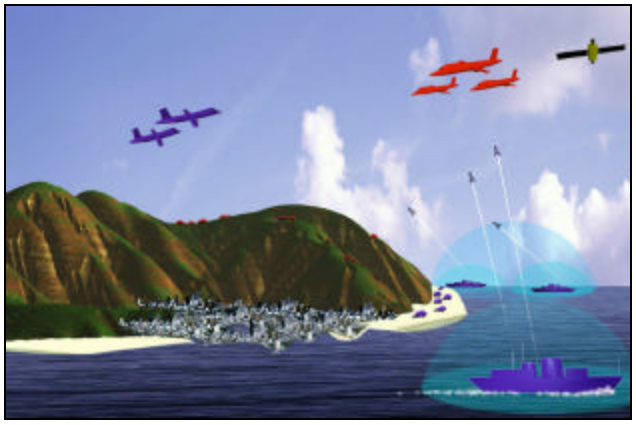
Defence R&D Canada – Valcartier

SEATS: A Simulation Environment for the Analysis of the Tactical Situation

- A proof-of-concept facility for situation analysis
- Prototyping of SA support systems
- Integration of all levels of data fusion

Tactical Situation Analysis

Situation Awareness (SAW) is essential for commanders to conduct decision-making activities. It concerns the perception of the elements in the environment, the comprehension of their meaning, and the projection of their status in the near future. Situation Analysis (SA) is defined as a process, the examination of a situation, its elements, and their relations, to provide and maintain a state of SAW for the decision maker. SA develops hypotheses about meaningful relations between entities and events, estimates the organizational structures and intentions of threat entities, assesses vulnerabilities of both own force and threat assets and the level of risk posed by the threat. Note that the definition of SA given above includes the classical notion of situation assessment, but only as an intermediate step of the overall SA process.



Military theatres of operations may be very challenging

Situation Analysis Support System (SASS)

Operational trends in warfare put the situation analysis process under pressure. The increasing tempo and diversity of scenarios, the advances in threat technology and the growing volume and imperfect nature of the relevant data and information in very complex environments are factors that pose significant challenges. They increase the risk of saturation in building the tactical picture and of making the wrong decision. On one hand, failure to resolve situation uncertainty and hesitation to act may lead to a fatal result; on the other hand, a very quick reaction to what appears to be a threat may lead to undesirable consequences. Still, the decision cycle must be performed quicker and better than that of the enemy to maintain the advantage. This emphasizes the need for a real-time, computer-based SASS to aid commanders in achieving the appropriate situation awareness, thereby supporting their response to actual or anticipated threats. The SASS assists in the development and display of the tactical picture, including higher levels of abstraction than elemental track plots, and supports projection of this picture and mental simulation for the purposes of resolving situation uncertainty, forming explanations of events, generating expectancies for the future, and evaluating courses of action.

The SASS Group and SEATS

The SASS Group at Valcartier is pursuing the exploration of SA concepts, and the prototyping of computer-based SASS. The research program comprises five main facets: 1) capture of user requirements, 2) definition and modeling of SA concepts, 3) SASS, 4) enabling disciplines/ technologies/techniques, and 5) performance evaluation. For this program, the SA Group has developed SEATS (Simulation Environment for the Analysis of the Tactical Situation). This is a modeling and simulation facility for the stimulation and performance measurement of SA capabilities running on a multi-agent architecture that is currently being used to implement the integrated data/information fusion framework required for SA. SEATS has been designed as a proof-of-concept facility with the intention of minimizing the development and maintenance cost of supporting technologies, and maximizing the exploration and demonstration of SA concepts. Many capabilities of SEATS are thus implemented through the use of commercial-off-the-shelf (COTS) products, and the re-use of legacy systems. The personal computer (PC) approach allows for a low development cost and makes the test bed transportable.

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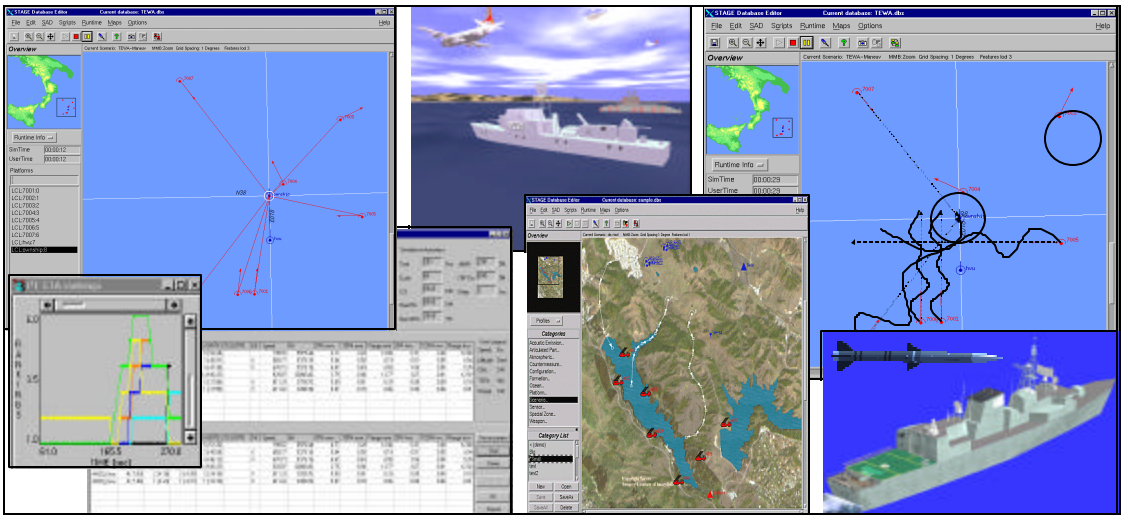

Samples of SEATS capabilities

SEATS Capabilities

Simulation

It supports the building and the real-time animation of synthetic tactical environments containing dynamic entities (e.g., planes, ships, tanks, missiles, etc.) interacting through tactical means (detection, communication, engagement, etc.). It also provides an extendable script language to allow entities to react to the conditions of their environment. This is important for temporal and spatial behavior analysis as one can simulate behaviors and therefore stimulate behavior analysis algorithms.

3D Visualization

It presents, in real-time, different 3D perspectives of the DIS/HLA (distributed interactive simulation / high-level architecture) battlefield provided by the simulation capability. It allows the user to visualize the DIS/HLA battlefield and virtually move through it, view entities/objects, or even attach the viewpoint to a specific entity/object.

Human-in-the-Loop Interaction

It provides means to monitor user actions (voice, keyboard, mouse, etc.) as these persons are being stimulated during simulations. It also provides means to allow human interactions with the simulation. For instance, a real pilot, through the use of an aircraft simulation model, could control one specific aircraft entity in the environment.

Graphical Interface Design

It provides means for the design of 2D/3D analytical and operator-like interfaces. Analytical displays are mainly designed to support the evaluation of the SA algorithms by the system designers/ developers. Operator-like interfaces are meant to be used for investigations on methodologies for situational awareness measurements with military users.

Performance Analysis Database

It allows the archiving of all data manipulated by either the users or the SA algorithms in the SEATS test bed

Performance Evaluation

It comprises a set of tools to assist the designers, users, and operators in the quantitative assessment of the performance of the investigated algorithms and techniques, and their supportive contribution to the situational awareness state.

Interconnectivity

The interconnection of local or distributed multiple simulation applications using DIS or HLA protocols is feasible, thereby granting their participation to DIS/HLA exercises. The use of other standard communication protocols or shared memory is also possible. Finally, middleware solutions for interconnectivity like Common Object Request Broker Architecture (CORBA) are also provided in SEATS.

For more information

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