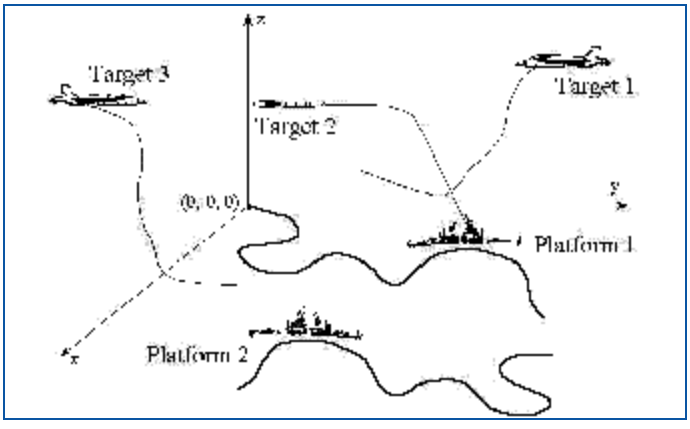
CASE ATTI: A Testbed for Sensor Date Fusion

- A high-fidelity simulator/stimulator
- Algorithm-level replacement capability
- Modular approach facilitates changes to algorithms, sensors and analysis tools

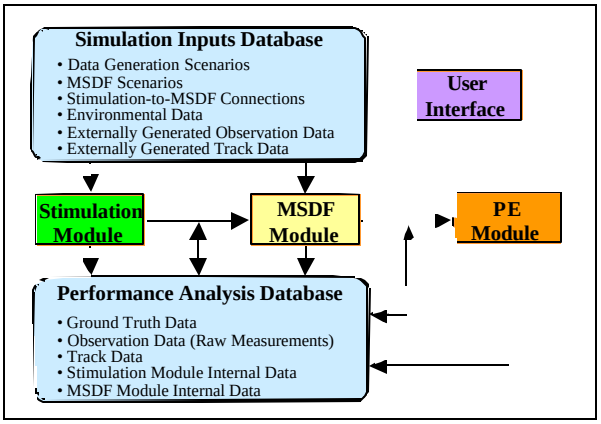
Tactical Situation Perception

Warfare environments are complex. Friendly, neutral and potentially hostile entities continuously slip into and out of the mission coverage. Sensing techniques are employed in military systems as the primary means to gain knowledge about the external environment, or to update and refine such knowledge. Typically, as a result of their intrinsic shortcomings, single sensor systems have limited capabilities for resolving ambiguities and providing consistent descriptions of the sensed environment. Despite advances in sensor technologies, no single sensor is capable of cost effectively obtaining all the required information, reliably at all times, in different and sometimes very dynamic environments.

Advanced military systems thus make use of multiple sensors in order to satisfy the extensive need for precise and timely information. Multi-sensor systems aim at overcoming the shortcomings of single sensors by employing redundancy and diversity. The appropriate selection, integration and management of several sensors, and the smart use of the resulting optimum data sets through data fusion, should provide an efficient and operationally valuable approach for military systems. Expected benefits of Multi-Sensor Data Fusion (MSDF) include earliest possible target detection, reliable target identification, counter-measure robustness, etc.



Typical test scenario



CASE ATTI high-level structure

CASE ATTI and Data Fusion Engineering

Developing a system that utilizes existing or developmental data fusion technology requires an appropriate methodology for selecting among architecture and technique alternatives for cost-effective satisfaction of system requirements. The generally accepted engineering guidelines for MSDF systems recommend a paradigm in which the design and development flow from overall system requirements and constraints to a specification of the role for data fusion within the system. Further partitioning results in a specification of a data fusion tree structure and corresponding nodes. Pattern analysis of the requirements for each node allows selection of appropriate techniques. While applying the MSDF engineering guidelines, the designers/developers/users/operators of MSDF systems clearly need capabilities that allow them to quantitatively assess if the architecture, algorithms and techniques of a proposed MSDF system are suitably satisfying system requirements.

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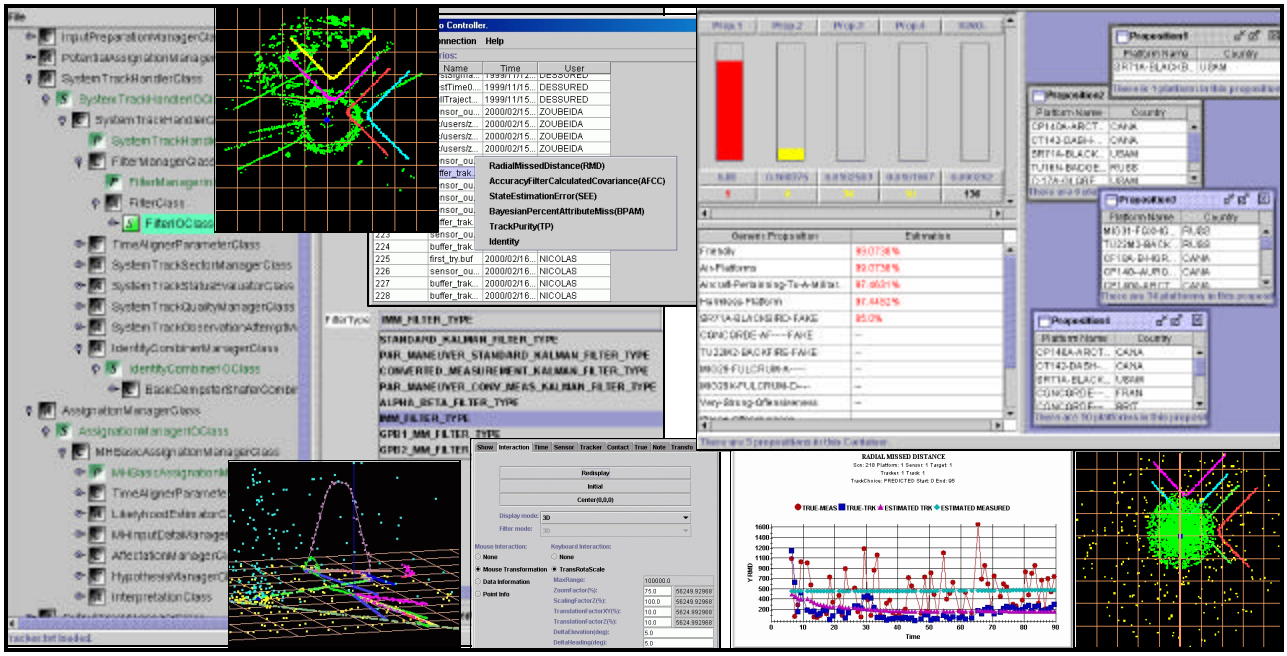
In that respect, the Valcartier scientists have provided help by developing a highly modular, structured, and flexible test bed, called CASE ATTI (Concept Analysis and Simulation Environment for Automatic Target Tracking and Identification), as a proof-of-concept demonstrator to achieve the continuing exploration of MSDF.

Simulation/Stimulation Capability

Besides the possibility of using externally generated data, real or simulated, CASE ATTI has a high-fidelity stimulator that emulates the behaviour of real targets, sensor systems and the meteoro-logical environment, allowing the user to create and edit test scenarios with multiple platforms/sensors/targets. The sensor platforms can be stationary or moving along user-predefined paths. One or several sensors can be assigned to each platform (currently, the stimulation module supports surveillance radar, IFF, ESM and IR sensor and link simulations). Targets are created with user-predefined 3D trajectories and attributes.

Flexibility in MSDF System Evaluation

One of the main requirements of the CASE ATTI test bed has also been to provide the algorithm-level test and replacement capability (required to study and compare the technical feasibility, applicability and performance of advanced, state-of-the-art MSDF techniques) where the user can switch between all available algorithms in the CASE ATTI library without re-coding and/or re-compiling. The MSDF system module supports a wide variety of MSDF architecture types, varying from a simple single sensor tracker to an arbitrary complex multiple sensor, multiple platform topology (including contact-level, track-level or hybrid fusion architecture types). A performance analysis database retains archives of all data manipulated. A performance evaluation module provides tools to assist in interpreting results through the quantitative assessment of MSDF systems performance. A user-friendly interface module supports all interactions with the users/operators.



A user-friendly interface module supports all interactions with the users/operators

Software Modularity and Portability

The Object-Oriented (OO) software design allows for the easy development and incorporation of new tracking and fusion algorithms, sensor models, and analysis tools. CASE ATTI runs on both UNIX and Windows platforms and the design also has the capabilities of utilizing multiple computers across a Local Area Network (LAN). Portability requirements have also driven the selection of the various software technologies used (e.g., C++, Oracle, OpenGL, Java, etc.).

For more information

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