

Focus on CSIR research in Systems Modelling

CSIR Defence, Peace,
Safety & Security

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Main focus

The CSIR Systems Modelling competency area forms part of the CSIR Defence, Peace, Safety and Security operational unit. It focuses on the presentation of problems at the system-of-systems-level and the facilitation of discovering the answers and solutions to the so-called "hard problems". It focuses research efforts in the appropriate branches of decision under uncertainty and complexity sciences, as we understand them today.

The Systems Modelling competency area strives to improve decision processes, using systems-level thinking and decision science, to contribute to improved protection and security for South Africa.

Research groups

Socio-technical systems

Real-world problems are almost always complex and do not yield to classical problem-solving and modelling approaches. This group specialises in approaches suited to these types of challenges, including reasoning under uncertainty using Bayesian networks,

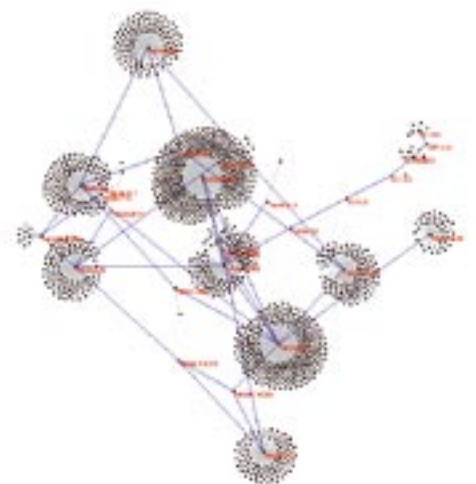
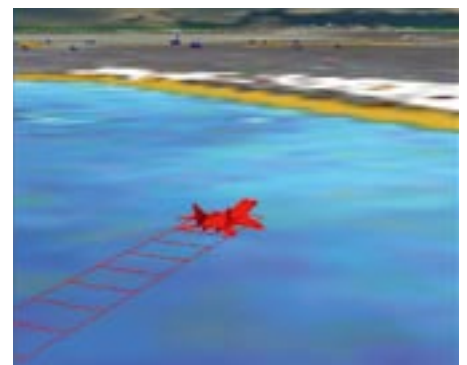
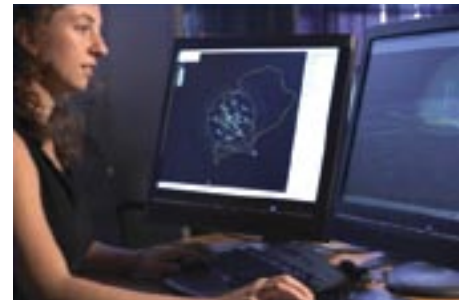
non-quantitative modelling using morphological analysis, and scenario planning, among others.

Recent projects include:

- Capability scoping of information warfare;
- Value proposition development for the South African Space Agency;
- Modelling of the systems of crime; and
- Probabilistic modelling of weapon systems effectiveness for the South African Navy.

Mathematical and computational modelling

The increasing capability and acceptance of Modelling and Simulation (M&S) as an effective tool to support the acquisition and utilisation of complex systems have made this an important area in which research institutes world-wide are developing and applying their technology bases.



This group focuses on the utilisation of system-of-systems-level simulation to support the capability establishment lifecycle.

Examples are:

- The use of M&S to support the Ground Based Air Defence System (GBADS) acquisition programme;
- Evaluation of joint air defence concepts through the use of virtual environments; and
- Involvement in field exercises in order to assist in the validation of draft tactical doctrine.

Systems engineering

The vision of this group is to serve as the core of a networked systems engineering capability and to support and grow in-house competence to:

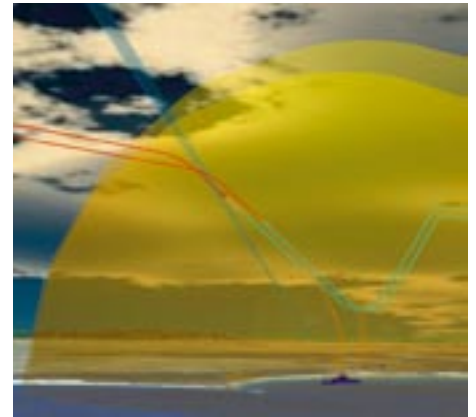
- Apply rigorous and systematic approaches to the development of systems concepts, the delivery of high-quality products, systems (including technology demonstrators and low-volume niche products) and system-level decision-support services; and
- Allow the unit to supply product and user system-level services to the Department of Defence.

Complex adaptive and netted systems

This capability is currently being developed through a number of research projects.

The projects are:

- Network intelligent traffic analysis (early warning, intrusion detection and prevention);
- Agent-based modelling research;
- Information warfare simulator development;
- Information warfare sensor systems;
- Information warfare situational awareness (data management and display); and
- Information system consultation services.



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