

Focus on CSIR services in Optronic Sensor Systems (OSS)

The CSIR's research in the field of Optronic Sensor Systems (OSS) focuses on new and novel electro-optic sensors, and the modelling, simulation, engineering, testing, evaluation and development of advanced electro-optical sensor systems for day, night and multispectral surveillance. In addition, researchers evaluate and design countermeasure and electronic warfare techniques in the visual and infrared wavelengths.

OSS Research Themes include -

Self Protection

- Measurement
- Modelling
- Simulation
- Missile exploitation
- Infrared counter measures

Advanced Optical Systems

- Helmet Tracker Technology
- Directed Infrared Counter measures (DIRCM)
- Surrogate Seeker
- Specialised Imaging Systems
- Laser Applications (Gated tech and Free Space Comms)

Surveillance Applications

- Image Processing
- Camouflage
- Sensor Evaluation

Information Application

- Management of large amounts of image data
- Interface data streams to other sensor nodes
- Exploitation/ utilisation of satellite image data

The research is supported by specialist facilities such as a test and evaluation laboratory, flight motion simulator, ship motion simulator and missile exploitation laboratories.

OSS can put together high-tech, multi-disciplinary teams and help customers to make impact in their client space.

The CSIR's Optronics group continues to work towards building its reputation of becoming the best in optical systems research and development.



Target Detection and Tracking

The CSIR has a strong capability in real-time image processing that has been extended to develop applications for target tracking. Computer Graphics Processing Units (GPUs) are used to accelerate image segmentation, object detection and target tracking. The Stand Alone Tracker (SAT) prototype is a high bandwidth pan-tilt-unit that uses some of these algorithms to track single targets in real-time. SAT is integrated with radar systems and consists of high resolution visual and infrared sensors that can be pointed at targets with high precision. Future applications will consider image fusion and appearance modelling for robust target tracking.

Examples of facilities and lead projects

Optronic Scene Simulator (OSSIM)

The development of sophisticated electro-optical equipment, such as infrared missile seekers and thermal imagers, requires radiometrically calibrated imaging scene simulators in order to evaluate and optimise system performance under diverse environmental conditions. OSSIM is an engineering development tool developed to meet this need. The simulator is written in C++ and runs on Windows and Linux systems. Accurate atmospheric modelling in OSSIM requires that MODTRAN be present. Current applications are mainly in the defence domain, but OSSIM can also be applied in the civilian world.

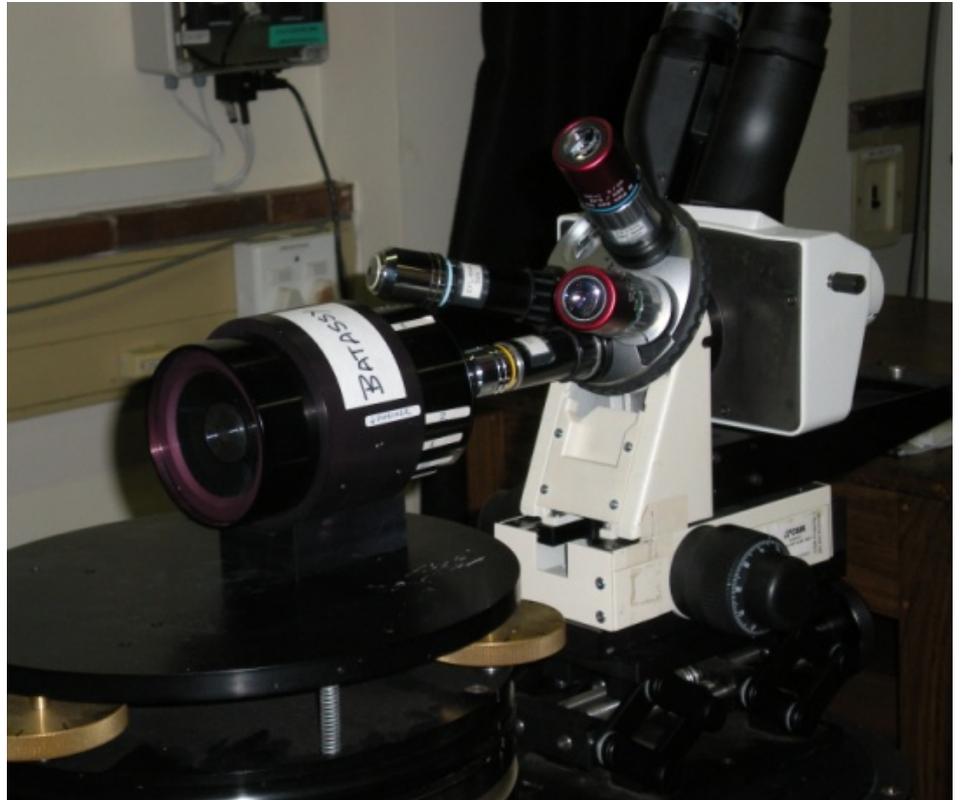
Camouflage

Over the past few decades, camouflage has become more science than art. The CSIR has conducted studies into the human visual system (psychological as well as physiological), in order to determine how people perceive their environment, how the information is processed and then acted upon. This knowledge is used to increase camouflage efficiency, and improve our evaluation techniques. A multi-purpose personal net was also developed for use by soldiers involved in border protection.

The Wide Area Surveillance System (WASS)

The WASS is used in the detection of small craft in the maritime environment, specifically in support of anti-piracy operations. The original prototype had a 60 degree field of view but further developments led to an omni-directional viewing capability, whilst retaining the ability to perform real-time stitching, background modelling and target tracking. In 2011, the WASS was ruggedised and modularised, resulting in two inter-operating 90 degree demonstration units mounted on the SAS Spioenkop in 2012 for evaluation by the South African Navy.

Current work is focused on fusing long-wave imagery to create a dual band, 24-hour capable system and improving the target detection and tracking.



The Test and Evaluation Laboratory

The situational awareness and threat identification afforded with surveillance cameras, night vision devices and infrared cameras, depend on the quality of images produced by these sensors. Performance deterioration occurs during normal use, storage or from abuse. This laboratory's capabilities include testing and evaluation of image quality on new and used sensors, in the field or in the laboratory. A range of real or simulated lighting and environmental conditions are possible. For clients, such test results provide confidence in continued tactical suitability of the sensor, or empower smart, informed acquisition or maintenance decision-making. Certain of the laboratory's testing capabilities are ISO/IEC 17025 accredited by the South African National Accreditation System (SANAS).

Optronic Sensor Systems

Dr Dirk Bezuidenhout

DBezuide@csir.co.za

dpss@csir.co.za

+27 12 841 3451

<http://www.csir.co.za/>