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Target and Background Signatures

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Introduction

Sensor technology and signal processing have been covered by various conferences at European SPIE Security and Defense symposiums since 2004. Increases in spatial, spectral, and temporal resolution and detectivity have been presented on since then. The broadening of the spectral coverage has also opened the path to unprecedented sensor applications. Targets and background signatures have always been an important component of the work presented, but scientific contributions from this field of research have remained somewhat hidden within presentations at the different conferences.

The topic Targets and Backgrounds: Characterization and Representation was formerly covered by a conference series at the 2011 SPIE Defense and Security symposium in Orlando. Since then, a Targets and Backgrounds conference series has ceased to exist. A new conference was set up at the 2015 SPIE Security and Defence Symposium in Toulouse, and it was intended to re-establish a conference on Target and Background Signatures in order to provide a proper forum for the involved research community.

The high number of papers submitted to the 2015 conference indicates that the signature research community really welcomed the revival of a forum to present and discuss target and background signatures. The contributions come from several organizations located in 13 countries from Europe, North America, Asia, and Australia.

The conference was divided into six sessions:
- Camouflage effectiveness
- Scene modelling
- Signature phenomenology
- Hyperspectral signatures
- Processing
- Human observer performance

The session on Camouflage Effectiveness made clear that the effectiveness of signature reduction and signature management should be assessed at different levels:
- Tactics
- Capabilities
- System signature
- Signature features

To help address all these levels, an integrated project approach is recommended— bringing different types of expertise together. This involves those in the industry working alongside researchers and military experts. The awareness of this approach set the tone for the conference.

The session on Scene Modelling showed excellent examples of current possibilities and capabilities in this field. Physical phenomena can be modelled with continuously increasing level of detail. An example of this was given in a presentation on effects of wakes on IR and radar signatures. However, despite the increase of computational power, physically accurate models can be very time consuming to run, and trade-offs have to be made between physical accuracy and computation time needed. This trade-off process will be supported by understanding the level at which the signature effects are being assessed and the level of detail needed.

The sessions on Signature Phenomenology and Hyperspectral Signatures illustrated investigations on a great variety of signature features. Modelling and scene generation builds on these efforts. Some examples given were on work involving (hyper)-spectral measurements and theoretical work on the capabilities of sensors. Papers were presented on the effect of environmental conditions on signatures and their effect on sensor performance.

Finally, the sessions on Processing and Human Observer Performance discussed methods to assess the effect of signature management on detection and tracking of targets at a system level. Several aspects of sensor processing were shown. Bringing in new perspectives on processing from the field of anomaly detection in radiological research, as presented, can be stimulating to the research in electro-optical target detection.

A great variety of methods for assessing human observer performance was shown, which contributes to the understanding of the observation process. This also helps define the level at which signature effects are assessed. For example, the time needed to detect an object in a specific scene does not translate automatically into the effect of survivability on the next level. However, the discussions after the presentations emphasized this.

We would like to thank authors, the program committee, and session chairs for sharing their efforts and expertise to make this a successful, well-attended conference.

We also would like to thank SPIE and their dedicated staff for providing a well-suited framework for the conference.

Karin U. Stein
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