Multisensor Data and Information Processing
(Preface to Special Issue)

Eric LEFEBVRE\textsuperscript{1}, Kiril ALEXIEV\textsuperscript{2}
\textsuperscript{1}Lockheed Martin Canada, E-mail: eric.lefebvre@lmco.com
\textsuperscript{2}Institute of Parallel Processing, Bulgarian Academy of Science, E-mail: alexiev@bas.bg

Keywords: multisensor data fusion, information processing, multisensor processing, remote sensing, sensor systems, data fusion

Last May from the 16\textsuperscript{th} to the 27\textsuperscript{th} in Albena, Bulgaria was held the NATO Advanced Study Institute (ASI) entitled \textit{Multisensor Data and Information Processing for Rapid and Robust Situation and Threat Assessment}. This ASI brought together 72 people from 13 European and North American countries to discuss through a series of 48 lectures the use of information fusion in the context of defence against terrorism, which is a NATO priority research topic.

Information fusion resulting from multi-source processing, often called multisensor data fusion when sensors are the main sources of information, is a relatively young (less than 20 years) technology domain. It provides techniques and methods for:

1) integrating data from multiple sources and using the complementarity of this data to derive maximum information about the phenomenon being observed;
2) analyzing and deriving the meaning of these observations;
3) selecting the best course of action; and
4) controlling the actions.

Various sensors have been designed to detect some specific phenomena, but not others. Data fusion

\textit{NATO ASI participants.}
applications can combine synergically information from many sensors, including data provided by satellites and contextual and encyclopedic knowledge, to provide enhanced ability to detect and recognize anomalies in the environment, compared with conventional means. Data fusion is an integral part of multisensor processing, but it can also be applied to fuse non-sensor information (geopolitical, intelligence, etc.) to provide decision support for a timely and effective situation and threat assessment.

One special field of application for data fusion is satellite imagery, which can provide extensive information over a wide area of the electromagnetic spectrum using several types of sensors (Visible, Infra-Red (IR), Thermal IR, Radar, Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Hyperspectral...). Satellite imagery provides the coverage rate needed to identify and monitor human activities from agricultural practices (land use, crop types identification...) to defence-related surveillance (land/sea target detection and classification). By acquiring remotely sensed imagery over earth regions that land sensors cannot access, valuable information can be gathered for the defence against terrorism.

Developed on these themes the ASI’s program was subdivided in ten half-day sessions devoted respectively to the following research areas:

- Target recognition/classification and tracking
- Sensor systems
- Image processing
- Remote sensing and remote control
- Belief functions theory
- Situation assessment

The lectures presented at the ASI proved to be of great contribution and importance to the research and development of the multisensor data fusion based surveillance systems used in rapid and robust situations and for threat assessment. The ASI gave all the participants the opportunity to interact and exchange valuable knowledge and work experience to overcome challenging issues in various research areas.

In order to encourage further the participation from the ASI attendee, an entire session was devoted to short conferences, instead of the regular lectures, where students and experienced researchers were invited to present their works. We are very thankful to the Sensors & Transducers Magazine for the opportunity it offers to publish in this issue a selection of these conferences presented at our ASI.

NATO ASI Co-Directors

2005 Copyright ©, International Frequency Sensor Association (IFSA). All rights reserved.
(http://www.sensorsportal.com)