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Electro-Optical Remote Sensing, Photonic Technologies, and Applications VIII; and Military Applications in Hyperspectral Imaging and High Spatial Resolution Sensing II

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Ainsley Killey, BAE Systems (United Kingdom)
- 8 Military Applications in Hyperspectral Imaging and High Spatial Resolution Sensing III
John D. Goglewski, European Office of Aerospace Research and Development (United Kingdom)

Introduction to Part A: Electro-Optical Remote Sensing

This conference attracted 31 papers, however some were withdrawn. The Lidar/Laser Radar Systems and Applications dominated with about 13 papers. Passive sensing involved about eight papers, and the rest were devoted to components and other related technologies.

In the session for New Devices and Technology, Prof. Charbon (Univ. of Delft) discussed recent advances in the field of time-resolved imaging sensors based on single-photon avalanche diode (SPAD) technology and silicon photomultipliers (SiPMs), and also showed a number of applications of these devices in the medical and other fields. Mark Itzler from Princetown Lightwave followed by describing Geiger mode APD arrays used for wide area mapping and imaging. Future development points towards large detector arrays (2556*256 or larger) with very high range resolution (< 10 cm).

The rest of this session was devoted to papers on THz scanning (I.O. Yildirim, et al., from Yildirim Beyazit Univ., Turkey), design and performance analysis of multilayer nested grazing incidence optics for X rays (F. Zuo, et al., Beijing Institute of Control Engineering, China), and non-contact measurement of an object's angular position by means of laser goniometer (Yuri V. Filatov, Saint Petersburg Electrotechnical Univ., Russian Federation).

In the Lidar/Ladar sessions, Agata M. Pawlikowska, et al. from Selex and Heriot-Watt Univ. (United Kingdom) showed results from long-range, high-range resolution imaging using a scanning single photon system. M. Tulldahl, et al. from FOI (Sweden) presented the integration of a new miniature ladar on a small UAV. Compared to lidar mapping from manned full-size aircraft, a small unmanned aircraft can be cost-efficient over small areas and more flexible for deployment.

Steinvall, et al. also from FOI, presented passive and active EO sensing close to the sea surface, and showed the advantage in using an eye safe laser ranger type of lidar to measure atmospheric extinction coupled to the performance of the other sensors. A synthetic aperture ladar concept for infrastructure monitoring was presented by Simon Turbide, et al. from INO (Canada). A laboratory demonstration of a scaled-down infrastructure deformation monitoring with an Interferometric Synthetic Aperture Ladar (IFSAL) system operating at 1.5 μm was described. Results show sub-millimeter precision on the deformation applied to the target.

L. Wu, et al. from Electronics Technology Group Corp. and the Harbin Institute of Technology (China) discussed range resolution improvement of a phase-coded lidar system utilizing detector characteristics for short codes acquisition. A laboratory experiment was shown. The results prove that the technique allows for

the use of multi-element detectors, such as CCD cameras that typically have slow read time.

The following lidar session had four papers on underwater lidar and imaging applications: Michael J. DeWeert, BAE Systems USA talked in an invited paper about 3DLASEM, which is a 3D flash lidar imaging simulation tool for ocean applications. M. Laurenzis, et al. from the French-German institute ISL described underwater laser imaging experiments in the Baltic Sea using both line scanner and gated viewing systems. Both laser-based system resolutions were much higher than those of side scan sonar or even synthetic aperture sonar (SAS) used on autonomous underwater vehicles (AUV), allowing ULS or LGV to be an effective additional technology for the classification and identification of underwater objects. In another paper from the same group, F. Christnacher, et al. described a new method for stabilizing the images from a gated viewing underwater systems to allow for accurate 3D reconstruction. They investigated a new method based on a combination between image registration by homography and 3D scene reconstruction through tomography or two-image technique. In the different experimental examples a cm resolution could be achieved.

Tulldahl from FOI (Sweden) showed how advanced processing of the lidar data a detailed mapping of the sea floor with various objects and vegetation is possible. This mapping capability has a wide range of applications, including detection of mine-like objects, mapping marine natural resources and fish spawning areas, as well as supporting the fulfillment of national and international environmental monitoring directives. Although data sets collected by subsea systems give a high degree of credibility, they can benefit from a combination with airborne lidar for surveying and monitoring larger areas.

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