



Contribution ID: 273

Type: oral

Advances in the Processing of VHR Optical Imagery in Support of Safeguards Verification

Tuesday, 21 October 2014 17:00 (20 minutes)

Under the Additional Protocol of the Non-Proliferation Treaty (NPT) complementing the safeguards agreements between States and the International Atomic Energy Agency, commercial satellite imagery, preferably acquired by very high-resolution (VHR) satellite sensors, is an important source of safeguards-relevant information. Satellite imagery can assist in the evaluation of site declarations, design information verification, the detection of undeclared nuclear facilities, and the preparation of inspections or other visits. With the IAEA's Geospatial Exploitation System (GES), satellite imagery and other geospatial information such as site plans of nuclear facilities are available for a broad range of inspectors, analysts and country officers. The demand for spatial information and new tools to analyze this data is growing, together with the rising number of nuclear facilities under safeguards worldwide. Automated computer-driven processing of satellite imagery could therefore add a big value in the safeguards verification process. These could be, for example, satellite imagery pre-processing algorithms specially developed for new sensors, tools for pixel or object-based image analysis, or geoprocessing tools that generate additional safeguards-relevant information. In the last decade procedures for automated (pre-) processing of satellite imagery have considerably evolved. This paper aims at testing some pixel-based and object-based procedures for automated change detection and classification in support of safeguards verification. Taking different nuclear sites as examples, these methods will be evaluated and compared with regard to their suitability to (semi-) automatically extract safeguards-relevant information.

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Session Classification: New Trends in Commercial Satellite Imagery