Automated image analysis
in the oil & gas industry

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OBJECT BASED IMAGE ANALYSIS
by eCognition
eCognition is deployed in 80+ countries worldwide
More than 3,000 licenses, across all geospatial disciplines
Customers and partners in the oil & gas industry include
- Geoscience Australia
- GDF SUEZ
- Enagas
- USGS
- NBB
- NASA
Object based image analysis (OBIA) allows for automation in image analysis, for all types of sensors and image data
eCognition can be fully integrated into workflows and even devices
OBIA in the oil & gas industry

Discovery
- Geoscience
- Australia
- Natural oil spill detection
- Geology

Production
- satellites
- GDF SUEZ
- Enagas
- Oil spill monitoring

Transport
- UAV
- Risk management

Refining
- aerial sensors
- NBB
- Cadastral changes

Distribution
- mobile sensors

Consumption
- Street furniture

Technologies:
- seismography
- satellites
- UAV
- aerial sensors
- mobile sensors

Applications:
- Geoscience
- Australia
- Natural oil spill detection
- Geology
- Oil spill monitoring
- Risk management
- Cadastral changes
- Street furniture
OBIA in the oil & gas industry

- We see increasing adoption of automated image analysis in the whole oil & gas value chain
- Key drivers vary across the value chain
  - Efficiency in distribution
  - Risk mitigation in transportation
  - Innovation in exploration
- Introduction and adoption of OBIA -and other technologies covering the whole value chain- seem to be primarily driven by single process improvements
- OBIA has the potential to improve many of the processes in the whole industry
- Different sensor technologies (seismography, satellites, UAV, aerial, mobile) drive their own value adding & service opportunities
Case 1: Oil spill detection

- System Characteristics
  - Solution Development for Geoscience Australia
  - Identification of potential natural oil slicks in aquatic SAR imagery
  - Task to be done in enterprise environment in batch processing mode
  - Task to be done on large number of datasets (several 100s of scenes)
  - Automatic reporting in thin-client application (html)
  - Reporting of confidence rating (primarily based on shape)

- Input Data
  - ERS-1, aquatic SAR imagery
  - Calibrated SAR imagery (in –dB) (calibration removes gradient across a scene)
  - Geo-coded SAR imagery (Lat, Long)
  - Multiple scenes

- Characteristics of Oil slicks
  - Lower backscatter (~1.5 stddev lower than mean of scene/subset)
  - Characteristic shape (i.e., high perimeter/area ratio)
Case 1: Oil spill detection
Case 1: Oil spill detection

- Output (Html-Reporting tool)
  - One table for each stack of scenes including
    - File/Scene name,
    - Number of potential slick candidates in each confidence category,
    - Summarized area of oil slicks,
    - Hyperlink to reporting of singles scenes.
  - For each scene containing slick candidates:
    - Oil slick ID
    - Confidence category of slick
    - Location of slick
    - Length, width & area of oil slick
- Application fields for eCognition SAR-based oil spill detection in aquatic environments:
  - Detection and monitoring of natural oil spills
  - Detection and monitoring of man-made oil disasters
  - Ship monitoring

Other example for eCognition-based aquatic application. Detecting oil spills from the Prestige Tanker disaster, Galicia (Spain), November 2002
Within a large project under EU sponsorship, the risks of new technologies are evaluated. One of these technologies is pipeline monitoring using an unmanned aerial vehicle (UAV)

- External damages to gas and oil pipelines need to be identified and reported to the operator on a daily basis
- OBIA offers an efficient and cost-effective way to identify potential hazards to pipelines
- eCognition objective: development of a semi-automated threat detection system based on aerial images
Case 2: risk management

- OBIA approach: change detection on different points in time
  - Potential external hazards: construction machinery, e.g. excavators

- Environmental changes: waterlogged surfaces, deep vehicle tracks, erosion, discolouring of vegetation due to pipeline leaks, etc.
Topics for discussion

- **Value adding sector scenarios**
  - Currently we see most value adders still operating in a project-by-project mode, with a rather early degree of automation in imaging & analysis.
  - We see similarities of the oil & gas industry with the life-sciences industry, where technologies & innovations are mostly driven within their process steps.
  - We believe value adders will increasingly make use of upstream processing and sensor arrays with high throughput processing.

- Satellite based value adding (upstream processing)
- Aerial, UAV & mobile based value adding (sensor arrays on the fly processing)
While data policy and pricing are important points for developing the EO service industry in the oil & gas industry we believe it is even more important to see the strengths and challenges of the industry itself.

Even though the industry is technology savvy in exploration, production and other areas, this does not mean the oil & gas industry is highly motivated in investing much time & money in making EO products and services fit their purposes – they rather expect vendors and suppliers to come up with ready made and (fully) functional solutions.

Current EO products and services fit some commercial purposes well, however, still require a rather high degree of remote sensing expertise to integrate them into decision making systems of the industry. Therefore, we see a strong desire of the industry to have technology players integrate their offerings in a ‘ready to use fashion’.

Accordingly, we could envision for ESA and other funding bodies a stronger role in moderating and facilitating technical integration of satellite based offerings, for example through standardization, pilot installations of upstream processing, data stacking, archiving and ready to use solutions.
Ralph D. Humberg
Business Area Manager eCognition
Trimble GeoSpatial Division, Munich
Ralph_Humberg@trimble.com

Christian Hoffmann
Operations Manager
Trimble GeoSpatial Division, Munich
christian_hoffmann@trimble.com