OUTLINE

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1. INTRODUCTION

• Severe forest fire caused the explosion of ammunition storage depot in Padjene, Croatia (September, 2011)
• Data acquisition module of Advanced Intelligence Decision Support System – multisensor imagery acquisition system was engaged for the aerial survey of wider area of ammunition storage.
2. Methodology

- Based on combination of pixel and object based image analysis
- Rules learned on test dataset are then applied on other images of the same scene but different locations
- Semi-automatic methodology instead of fully automatic
- Easily applicable to different sensor data
- Transferable to different objects of interest
TIRAMISU METHODOLOGY FOR SEMI-AUTOMATED INTERPRETATION OF DIGITAL MULTISENSOR IMAGES

- **Segmentation**
  - Pre-processing of input image (PCA, ICA, CIELAB)

- **Application**
  - Common methods for image processing

- **Final Results**
  - Combination of partial results of image processing
  - Statistical analysis of the parameters of segments
3. **Validation**

- Performed on 25 aerial Nikon D90 matrix RGB images acquired over the exploded ammunition depot in Padjene.
- Randomly selected spatial subset of 500 by 500 pixels for every image was defined as validation sample.

![Aerial Nikon D90 image of exploded ammunition depot, red rectangle – spatial subset used for validation purposes, b – segmented image, spatial subset used for ground truth definition](image)

- Ground truth data created by visual interpretation and manual classification, b – Result of implemented methodology on the spatial subset; red – corroded objects, blue – not corroded
## Validation - Results

### TIRAMISU METHODOLOGY FOR SEMI-AUTOMATED INTERPRETATION OF DIGITAL MULTISENSOR IMAGES

<table>
<thead>
<tr>
<th></th>
<th>Commission Error for Corroded Objects [%]</th>
<th>Omission Error for Corroded Objects [%]</th>
<th>Overall Accuracy [%]</th>
<th>Kappa Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>18.54</td>
<td>5.57</td>
<td>99.52</td>
<td>0.85</td>
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<tr>
<td>Min</td>
<td>0.00</td>
<td>0.00</td>
<td>97.26</td>
<td>0.27</td>
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<tr>
<td>Max</td>
<td>84.20</td>
<td>43.02</td>
<td>100.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Summarized confusion matrix values for 25 analyzed images**

**a** - Histogram of commission error in percentage for corroded objects, 
**b** - Histogram of omission error in percentage for corroded objects, 
**c** - Histogram of kappa coefficient
4. CONCLUSION

- Manual image interpretation is time-consuming while automatic methods of image processing cannot provide sufficiently reliable data for this application.
- Methodology devised aims to assist interpreter to execute needed tasks more efficiently, rather than to replace him.
- Presented methodology is sensor independent and can also easily be applied on different objects of interest.
- Future steps include evaluation and implementation of more statistical tools that are used for selection and ranking of image processing for the needs of targeted object detection and extraction.
THE CONCEPT OF METHOD FOR SEMI-AUTOMATIC INTERPRETATION WITHIN T-AI DSS

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Ivan Racetin, Andrija Krtalic