Segmentation of forest geospatial data with scale-adaptive superpixels algorithm

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Introduction:

Superpixel segmentation:

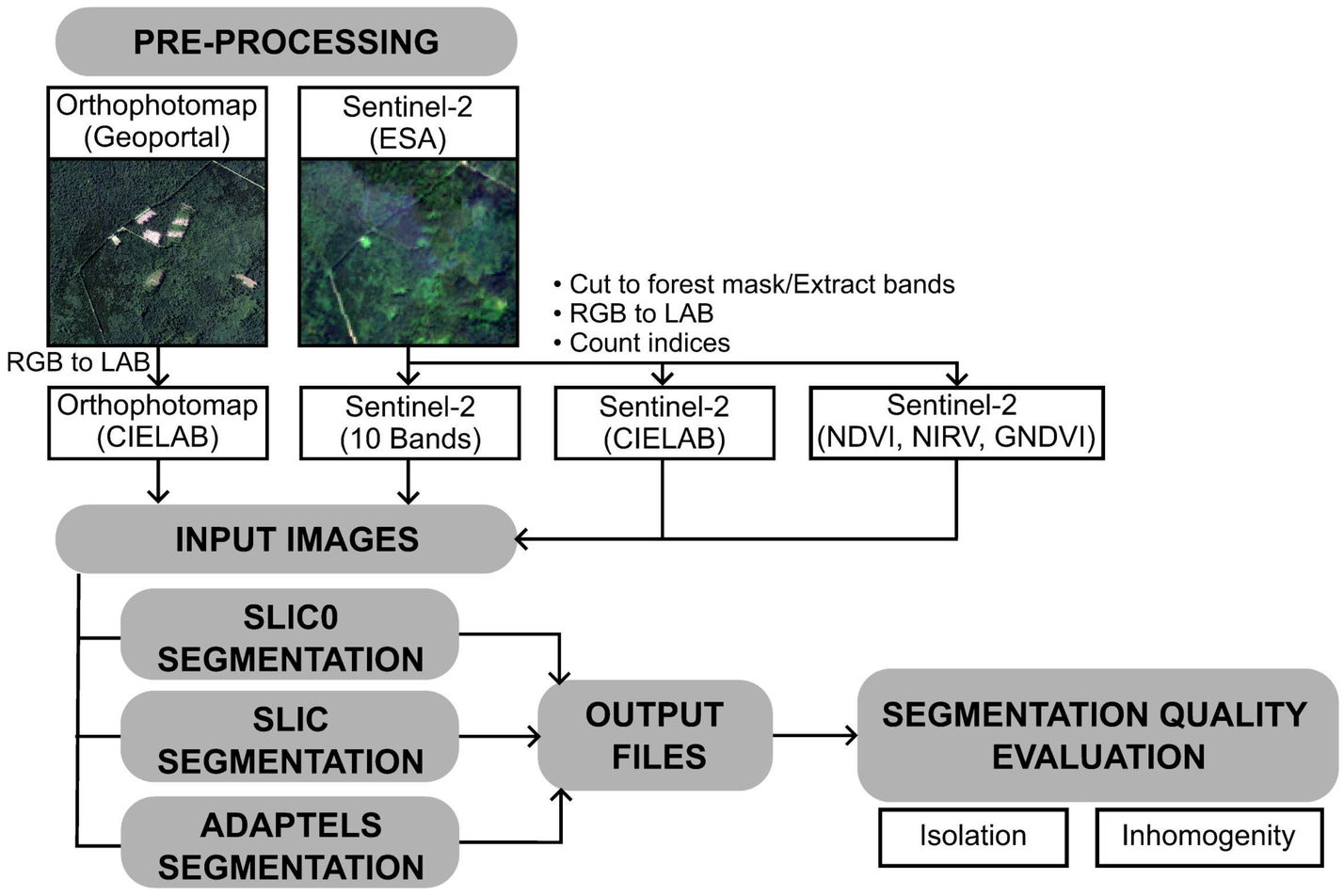
- pixels are divided by their color, intensity and texture
- possible usage:
  - ⇒ image classification;
  - ⇒ potential anomalies detection;
  - ⇒ monitoring the condition of forest ecosystems.

What are scale-adaptive superpixels (adaptels)?

- segments are multi-scaled
- maintain the intrinsic uniformity characteristic of other superpixel algorithms, e.g. SLIC, SLIC0
- do not maintain a constant dimension, shape and location, unlike other superpixel methods
- don't require to specify the n parameter of the number of superpixels generated for an image along with their starting points
- work for geospatial data

The Adaptel algorithm was implemented within plGeoAdaptels software. For a detailed information regarding algorithm, see: Anchanta, R., et al. (2018). "Scale-adaptive superpixels".

Workflow:

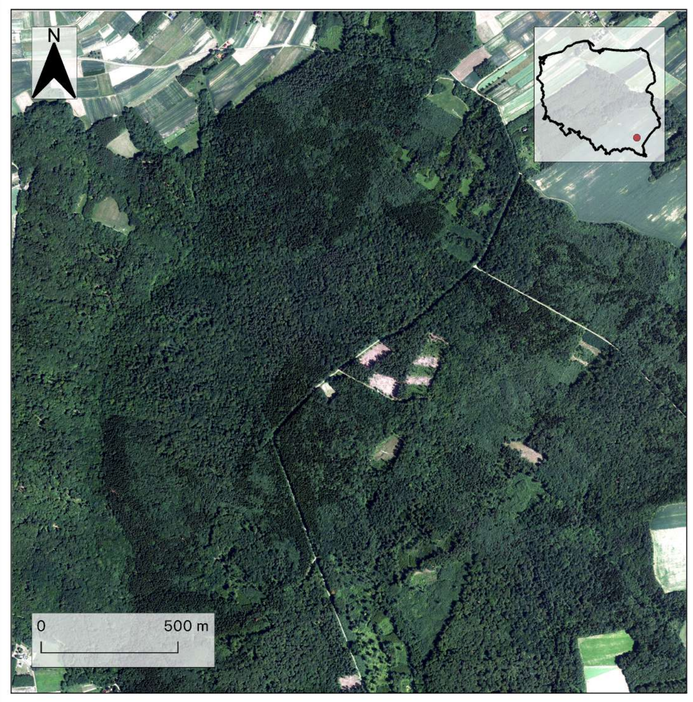


Segmentation evaluation:

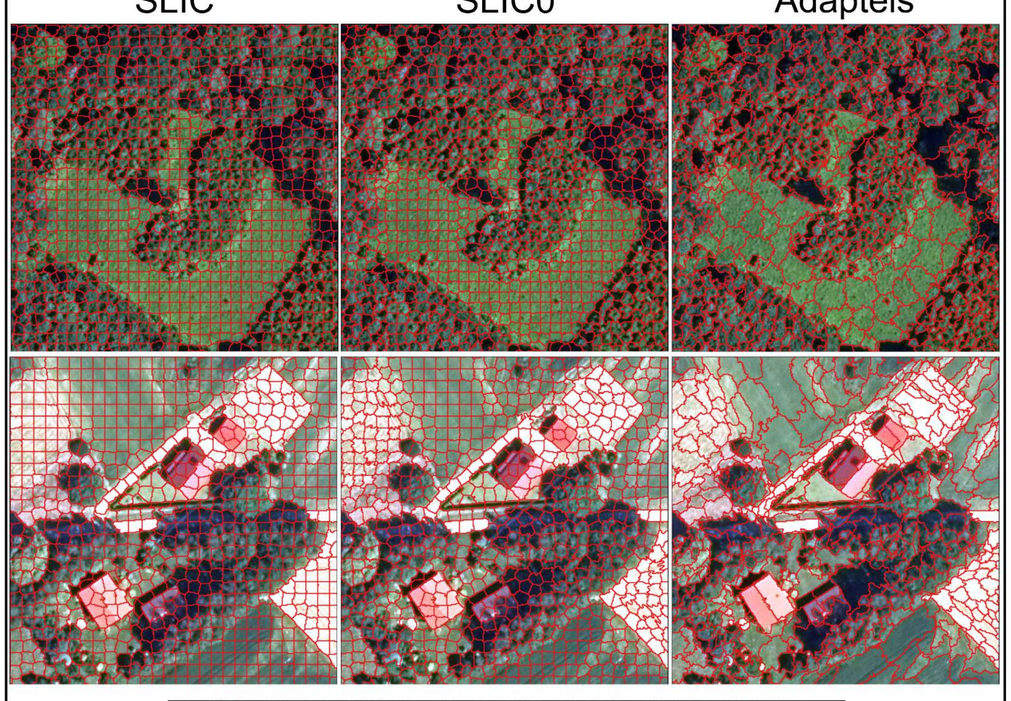
SEGMENTATION QUALITY	Orthophotomap (CIELAB)		
	SLIC	SLIC0	ADAPTELS
TIME [s]	142,76	138,57	43,16
SEGMENTS CREATED	590 873	590 311	455 716
ISOLATION	4,68	4,69	13,80
INHOMOGENITY	2,88	2,72	2,83
OVERALL QUALITY	**0,35**	**0,39**	**0,79**

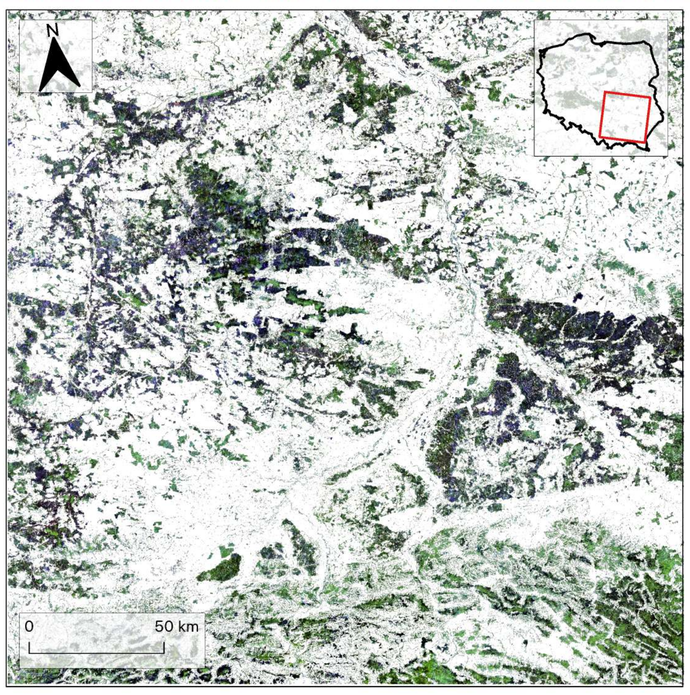
SEGMENTATION QUALITY	Sentinel-2 (CIELAB)			Sentinel-2 (Indices)			Sentinel-2 (10 Bands)		
	SLIC	SLIC0	ADAPTELS	SLIC	SLIC0	ADAPTELS	SLIC	SLIC0	ADAPTELS
TIME [s]	1310,23	1048,36	491,30	-	-	407,86	-	-	1120,84
SEGMENTS CREATED	1 975 132	1 944 215	1 912 257	-	-	1 937 821	-	-	1 969 830

Results:

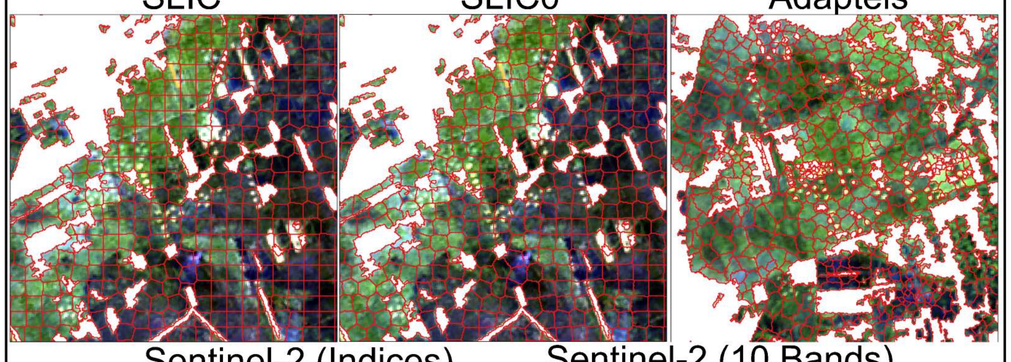


SLIC SLIC0 Adaptels





Sentinel-2 (CIELAB) SLIC | Sentinel-2 (CIELAB) SLIC0 | Sentinel-2 (CIELAB) Adaptels



Sentinel-2 (Indices) Adaptels | Sentinel-2 (10 Bands) Adaptels