Modeling and Parameter Estimation of TerraSAR-X Images for Scene Classification and Recognition

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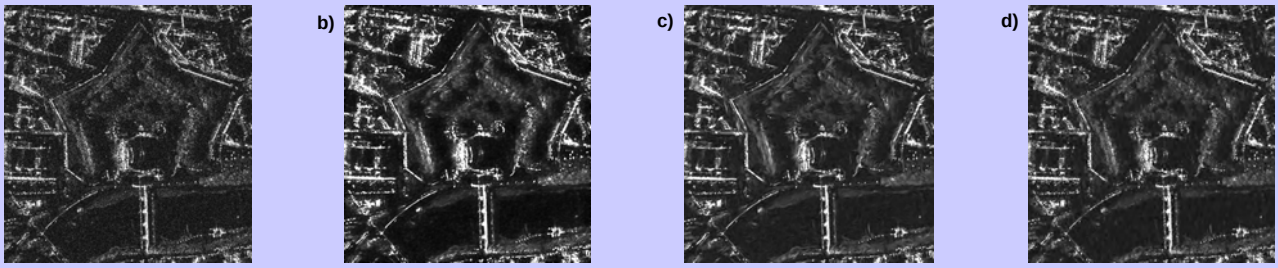
Advanced despeckling methods allow us to reduce the speckle noise, while preserving local details and texture.

Example: Vatican City; a) high res spotlight GEC image, b) wavelet-based despeckling, c) model-based despeckling, d) MAP-ABM despeckling (our choice)

a) b) c) d)



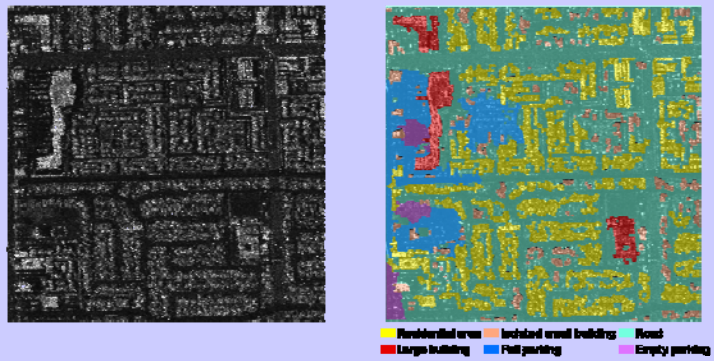
Subsequent Image Classification (pixel-based approach):

a) b) c)

Sichuan, China (2008 earthquake area):
a) despeckled image, b) vegetation, c) large buildings;

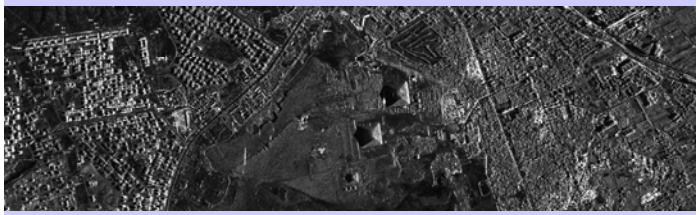
Classification by a semantic search engine provides target classes.

Subsequent Image Segmentation (object-based approach):



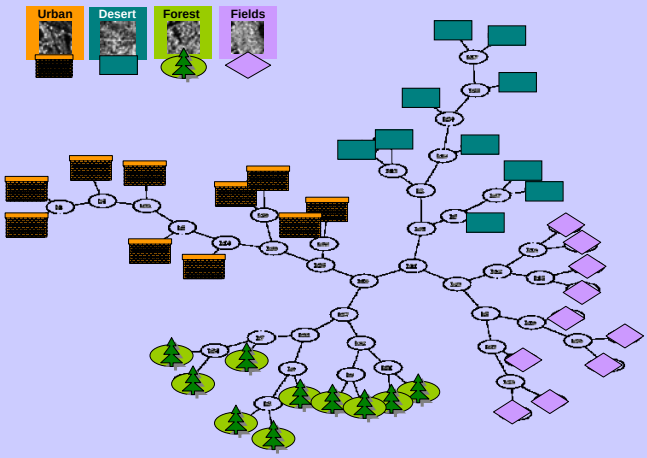
Las Vegas, USA: After pixel averaging, semi-automated area interpretation results in clearly segmented urban area classes.

Hierarchical Image Clustering (tile-based approach)

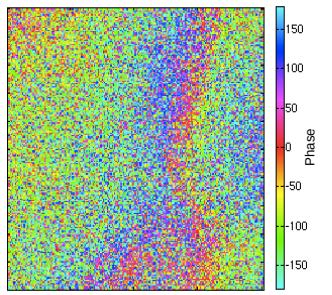


Gizeh, Egypt:

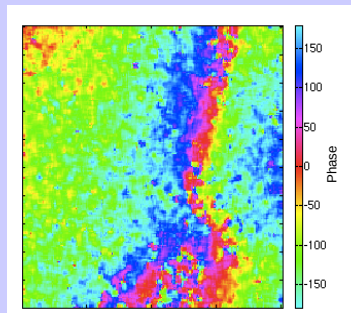
parameter-free unsupervised clustering based on inter-tile distances



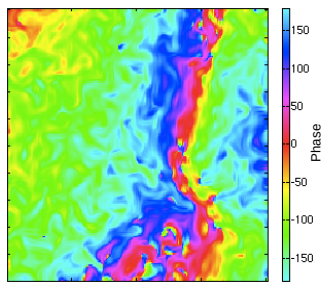
Interferogram Filtering (phase diffusion approach)



Color representation of a section of a low coherence interferogram based on TerraSAR-X data (coherence = 0.5).



Denoised interferogram after 5x5 multilooking (conventional approach).



Interferogram denoising by anisotropic phase diffusion. The fringes are well preserved and we obtain a very low number of residuals.

The diffusion is driven by estimates of the local geometry given by a structure tensor. Coherent structures are enhanced.