Unsupervised SAR Images Change Detection With Hidden Markov Chains On a Sliding Window

**HMC on a sliding window**

- Original image
- HMC
- HMC $\lambda=40$
- Step 1: Parameters Initialization using "K-means" for example
- Step 2: Parameters Estimation using "Estimation-Maximization" (EM)
- Step 3: Segmentation using "Maximal Posterior Mode" (MPM) or "Maximum A Posteriori" (MAP)
- Original Signal ($y$)
- Segmented Signal ($\hat{x}$)

**Change detection on simulated SAR images**

- Image before $I_1$
- Introduced changes
- Image after $I_2$
- Criterion image
- $I_{k,n}(\cdot,\cdot) = \log\left(\frac{\sum_{k \in A_n \cap A_0} I_1(k, \cdot)}{\sum_{k \in A_0} I_1(k, \cdot)}\right)$
- $\lambda=40$
- $\text{FAR}=17.45\%$
- $\text{GKLD}^{(*)}$

**Change detection on real SAR images**

- Image before eruption
- $\text{FAR}=25.07\%$
- $\text{HMC}$
- Image after eruption
- $\text{HMC}^{(*)}$
- $\lambda=40$
- $\text{FAR}=17.45\%$
- $\text{GKLD}^{(*)}$

**Conclusion**

- **Main contributions of this work**
  - Overcoming stationary constraint of classical HMC model in unsupervised image segmentation.
  - Application in unsupervised change detection on bi-dates SAR images.

- **Further work**
  - Studying optimal size of the sliding window.
  - Studying model selection criteria for small sample.

**References**


