

ERCIM “Alain Bensoussan” Fellowship Scientific Report

Fellow: Koray Kayabol

Visited Location : Ariana, INRIA Sophia Antipolis – Mediterranee, France

Name of Supervisor : Prof. Josiane Zerubia

Duration of Visit: 01.11.2010 – 31.07.2011

I - Scientific activity

During my postdoctoral fellowship, I have been worked on high resolution Synthetic Aperture Radar Image (SAR) classification. In [1], we combine both amplitude and texture statistics of the SAR images using Products of Experts (PoE) approach for classification purpose. We use Nakagami density to model the class amplitudes and a non-Gaussian Markov Random Field (MRF) texture model with t-distributed regression error to model the textures of the classes. A non-stationary Multinomial Logistic (MnL) latent class label model is used as a mixture density to obtain spatially smooth class segments. The Classification Expectation-Maximization (CEM) algorithm is performed to estimate the class parameters and to classify the pixels.

In [2], we resort to Classification Likelihood in Mixture (CLM) criterion to determine the number of classes for previously proposed model in [1]. We obtained some classification results of water, land and urban areas in both supervised and unsupervised cases on TerraSAR-X data. Using an agglomerative type unsupervised classification method, we get rid of the negative effect of the latent class label initialization. According to our experiments, the larger number of classes, we start the algorithm with, the more initial value independent results, we obtain. Consequently, the computational cost is increased as a by-product. The speckle type noise is effects the algorithm especially in single-look observation case. The statistics of the noise may be included to the model to obtain better classification/segmentation in case of low signal to noise ratio.

We have written an INRIA research report [3] and we plan to write a journal paper which covers all work in [1] and [2].

II- Publication(s) during your fellowship

- [1] K. Kayabol, A. Voisin and J. Zerubia, “SAR image classification with non-stationary multinomial logistic mixture of amplitude and texture densities,” in Int. Conf. Image Process. ICIP’11, accepted, Brussels, Belgium, Sep. 2011.
- [2] K. Kayabol, A.V. Krylov and J. Zerubia, “Unsupervised Classification of SAR Images using Hierarchical Agglomeration and EM,” in Int. ERCIM MUSCLE Workshop Comput. Intelligence Multimedia Understanding, submitted, Pisa, Italy, Dec. 2011.
- [3] K. Kayabol and J. Zerubia, “Unsupervised amplitude and texture based classification of SAR images with multinomial latent model,” INRIA Research Report, France, July 2011.