

Automatic Target Recognition in SAR Images Based on Sparse Representation Technique

Authors : Ahmet Karagoz, Irfan Karagoz

Abstract : Synthetic Aperture Radar (SAR) is a radar mechanism that can be integrated into manned and unmanned aerial vehicles to create high-resolution images in all weather conditions, regardless of day and night. In this study, SAR images of military vehicles with different azimuth and descent angles are pre-processed at the first stage. The main purpose here is to reduce the high speckle noise found in SAR images. For this, the Wiener adaptive filter, the mean filter, and the median filters are used to reduce the amount of speckle noise in the images without causing loss of data. During the image segmentation phase, pixel values are ordered so that the target vehicle region is separated from other regions containing unnecessary information. The target image is parsed with the brightest 20% pixel value of 255 and the other pixel values of 0. In addition, by using appropriate parameters of statistical region merging algorithm, segmentation comparison is performed. In the step of feature extraction, the feature vectors belonging to the vehicles are obtained by using Gabor filters with different orientation, frequency and angle values. A number of Gabor filters are created by changing the orientation, frequency and angle parameters of the Gabor filters to extract important features of the images that form the distinctive parts. Finally, images are classified by sparse representation method. In the study, l_1 norm analysis of sparse representation is used. A joint database of the feature vectors generated by the target images of military vehicle types is obtained side by side and this database is transformed into the matrix form. In order to classify the vehicles in a similar way, the test images of each vehicle is converted to the vector form and l_1 norm analysis of the sparse representation method is applied through the existing database matrix form. As a result, correct recognition has been performed by matching the target images of military vehicles with the test images by means of the sparse representation method. 97% classification success of SAR images of different military vehicle types is obtained.

Keywords : automatic target recognition, sparse representation, image classification, SAR images

Conference Title : ICMLPR 2017 : International Conference on Machine Learning and Pattern Recognition

Conference Location : Istanbul, Türkiye

Conference Dates : July 27-28, 2017