ANN-based image segmentation and feature extraction to distinguish oil spills from 'look-alike' spots in SAR imagery

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This paper will present new Artificial Neural Network (ANN) methods for two stages of oceanic oil spill detection from Synthetic Aperture Radar (SAR) imagery: image segmentation for dark spot detection and feature vector evaluation. For image segmentation, a new ANN approach has been developed that performs significantly better than established edge detection segmentation and adaptive thresholding techniques. A second ANN has been implemented for feature evaluation: differentiating oil spills from look-alike dark spots. A major emphasis of this element of the work has been the development of an improved feature description vector. A 14-parameter feature description vector has been developed that incorporates both established and new parameters. The relative importance of individual feature parameters has been evaluated.

More than 60 SAR images form ENVISAT and ERS-2 have been used to assess the proposed new oil-spill detection methodology. Overall accuracies of better than 96% for dark spot segmentation and 92% for classification have been obtained. The new methodology demonstrably outperforms more conventional approaches and appears promising both in detecting dark spots and discriminating oil spills from look-alikes.