[Bea1999]

Evaluation of a Least Commitment Approach for Feature Preserving in SAR Image Filtering

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Conference: Classification Society of North America Annual Meeting, 1999

August, 1999, p. 8

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The conflicting goals of SAR image filtering are the removing of the speckle noise by smoothing while preserving the image structures such as specular spots, lines and region boundaries. In the Least Commitment Approach, we have considered the different kinds of decision processes that can be used for SAR image filtering. The "minimum commitment" rule states that we should first apply the most reliable ones. An unreliable decision should therefore be postponed until enough confidence is accumulated. The characteristics of radar signals have been carefully studied by many authors and for a given application, we know the probability density function of the speckle, hence, the gamma distribution is generally used.

The filtering process can be evaluated by comparing the estimated value $\hat{R}$ with the through value R (the mean backscattering signal). In statistics, the quality of an estimator is measured by its bias and its dispersion around the mean value. The evaluation of filters for heterogeneous area has not yet received a uniform and scientific sound definition. The main aspect is that the area will consist of at least two distinct regions with distinct R values and that the filtering process will blur the edges between them.

We use the bias and the variance of the estimator to evaluate the preservation of features or edges. The blurring or displacement of the edge introduces an important bias in the estimator. The bias value is higher at the edge point and decreases as the distance to the edge increases. An edge displacement will produce an asymmetric decrease of the bias. Stronger blurring results in a slower decrease of the bias. Therefore, the bias contains the most important information about the edge preservation.