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A statistical distribution texton feature for SAR image classification

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Corresponding author: Chu He

E-mail: chuhe@whu.edu.cn

 ORCID: <http://orcid.org/0000-0003-3662-5769>

Motivation

- Introducing the FLS framework into SAR image analysis.
- Using the proper distributions obtained by the model selection method in (Vladimir et al.,2008) instead of the filters in the information collecting module of the framework for texture analysis, owing to the coherence of SAR imaging.
- Applying the clustering and statistical module and the related algorithm that have been proved very effective in optical image to construct a feature descriptor of SAR image.

Main idea

- The parameter estimation of statistical distribution can replace the filtering operation in the traditional texture analysis of SAR images.
- In the extraction process of s-texton feature, several strategies have been adopted, including pre-processing, spatial gridding, parameter estimation, texton clustering, and histogram statistics.

Method

1. The FLS framework introduced in our previous work (He et al., 2008) is a novel development of the original LBP operator which comprises of the information collecting, labeling and statistics module.
2. Choose distributions that are widely used and have suitable analytic solutions for parameter estimation.
3. MoLC is utilized to estimate the distribution parameters.
4. Based on the texton feature from the framework and distribution characters of SAR images, a statistical texton (s-texton) feature is derived especially for SAR images.

Major results

- S-Texton can mostly achieve better performance than other published approaches.

Table 3 Classification accuracy of the s-texton approach and other published approaches

Approach	Classification accuracy (%)							Average
	Forest	Hill	Industry	Farmland	Pool	River	Residential	
Gabor	49.00	54.00	46.00	43.00	79.00	59.00	49.00	54.14
GLCM	46.00	41.00	42.00	54.00	86.00	72.00	53.00	56.29
DSEM_MRF	82.00	57.00	38.00	74.00	83.00	100.00	58.00	70.29
GMRF	79.00	76.00	61.00	75.00	99.00	99.00	71.00	80.00
s-texton	93.00	93.00	68.00	72.00	100.00	100.00	72.00	85.43

Bold numbers indicate the best results

Conclusions

- The statistical estimation methods are used instead of the filtering operation, and different estimators have been applied in the parameter estimation process.
- Experiments evaluated the classification performances of different estimators and grid patterns in the proposed method, and the classification results show the superiority of the s-texton feature.