UNCERTAINTY ESTIMATION OF IMAGE CLASSIFICATION IN HAZE-CONTAMINATED AREA THROUGH WEIGHTS OF EVIDENCE MODEL

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ABSTRACT: Haze is an inevitable interference when mapping land use/cover with optical satellite imagery. In this study, we applied weights of evidence model to locate possible area with omission and commission errors and estimate the degree of uncertainty for image classification in haze-contaminated area. Agricultural area in Chiayi, Taiwan is chosen as the study area. We used Landsat-5 TM images and maximum likelihood classifier to classify the land cover into six dominant classes in the study area: water, vegetation, bare soil, shadow, concrete built-up area, and asphalt road. Haze thickness and distances to clusters are assumed as the key factors for uncertainty estimation. For haze thickness, we applied Fourier analysis and high-pass filter to filter the haze-contaminated image and then spectral change vector analysis was used to acquire the magnitude of the difference between pre-filtered and post-filtered images (Shiu, 2011). The magnitude of the difference can be considered as the haze thickness information. For distance to clusters, distances in multi-spectral space between a pixel's signature and all training clusters can be computed during the procedure of maximum likelihood classification. We chose distance to the first, second and third closest clusters as the representation of classification confidence. Finally, the weights of evidence model was used to combine the four key factors to map the uncertainty estimation results. Model assessment with the receiver operating characteristics (ROC) shows the area under curve (AUC) is 0.69, which can be classified as good level (Pourghasemi et al., 2012). The model also indicates the two most significant factors are distance to first cluster and haze thickness, which is different from the findings of the previous study (Mitchell et al., 2008). Future applications include providing the possible misclassification areas for human-computer

interactive interpretation. It can be helpful to improve the accuracy by using the human interpretation method to re-interpret the possible misclassification areas.

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