

A modified temporal criterion to meta-optimize the extended Kalman filter for land cover classification of remotely sensed time series

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Abstract

Humans are transforming land cover at an ever-increasing rate. Accurate geographical maps on land cover, especially rural and urban settlements are essential to planning sustainable development. Time series extracted from MODerate resolution Imaging Spectroradiometer (MODIS) land surface reflectance products have been used to differentiate land cover classes by analyzing the seasonal patterns in reflectance values. The proper fitting of a parametric model to these time series usually requires several adjustments to the regression method. To reduce the workload, a global setting of parameters is done to the regression method for a geographical area. In this work we have modified a meta-optimization approach to setting a regression method to extract the parameters on a per time series basis. The standard deviation of the model parameters and magnitude of residuals are used as scoring function. We successfully fitted a triply modulated model to the seasonal patterns of our study area using a non-linear extended Kalman filter (EKF). The approach uses temporal information which significantly reduces the processing time and storage requirements to process each time series. It also derives reliability metrics for each time series individually. The features extracted using the proposed method are classified with a support vector machine and the performance of the method is compared to the original approach on our ground truth data.