Event: Conference
NCTS# 22185-16 AGU Fall Meeting 2015
San Francisco, CA
14-18 December 2015
AGU 2015 URL: http://fallmeeting.agu.org/2015/

Title:
Continental Spatio-temporal Data Analysis with Linear Spectral Mixture Model using FOSS

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Abstract: Poster

This work demonstrates the development and implementation of a Fully Constrained Least Squares (FCLS) unmixing model developed in C++ programming language with OpenCV package and boost C++ libraries in the NASA Earth Exchange (NEX). Visualization of the results is supported by GRASS GIS and statistical analysis is carried in R in a Linux system environment. FCLS was first tested on computer simulated data with Gaussian noise of various signal-to-noise ratio, and Landsat data of an agricultural

scenario and an urban environment using a set of global endmembers of substrate (soils, sediments, rocks, and non-photosynthetic vegetation), vegetation that includes green photosynthetic plants and dark objects which encompasses absorptive substrate materials, clear water, deep shadows, etc. For the agricultural scenario, a spectrally diverse collection of 11 scenes of Level 1 terrain corrected, cloud free Landsat-5 TM data of Fresno, California, USA were unmixed and the results were validated with the corresponding ground data. To study an urbanized landscape, a clear sky Landsat-5 TM data were unmixed and validated with coincident World View-2 abundance maps (of 2 m spatial resolution) for an area of San Francisco, California, USA. The results were evaluated using descriptive statistics, correlation coefficient, RMSE, probability of success, boxplot and bivariate distribution function. Finally, FCLS was used for sub-pixel land cover analysis of the monthly WELD (Wen-enabled Landsat data) repository from 2008 to 2011 of North America. The abundance maps in conjunction with DMSP-OLS nighttime lights data were used to extract the urban land cover features and analyze their spatial-temporal growth.

Key Words:
Landsat Satellites
Satellite Imagery
Agriculture

Abstract URL: https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/75922

Presentation Date:
Monday, 14 December 2015