Announcing the Final Examination of Subrina Tahsin for the degree of Master of Science

Time & Location: March 31, 2016 at 3:00 PM in Engineering II 324 (CHAMPS Lab)
Title: Remote sensing of coastal wetlands: long term vegetation stress assessment and data enhancement technique

Apalachicola Bay in the Florida panhandle is home to a rich variety of salt water and freshwater wetlands but, unfortunately, is also subject to a wide range of hydrologic hazards. Extreme hydrologic events such as hurricanes and droughts continuously threaten the area. The impact of hurricane and drought on both fresh and salt water wetlands was investigated over the time period from 2000 to 2015 in Apalachicola Bay using spatio-temporal changes in the Landsat based NDVI. Results indicate that salt water wetlands were more resilient than fresh water wetlands. Results also suggest that in response to hurricanes, the coastal wetlands took almost a year to recover while recovery following a drought period was observed after only a month. This analysis was successful and provided excellent insights into coastal wetland health despite its dependence on an optical sensor that is subject to data loss as a result of cloud coverage.

Cloud contamination is a hindrance to long-term environmental assessment using information derived from satellite imagery that retrieves data from visible and infrared spectral ranges. Normalized Difference Vegetation Index (NDVI) is a widely used index to monitor vegetation and land use change. NDVI can be retrieved from publicly available data repositories of optical sensors such as Landsat, Moderate Resolution Imaging Spectro-radiometer (MODIS) and several commercial satellites. Landsat has an ongoing high resolution NDVI record starting from 1984. Unfortunately, the time series NDVI data suffers from the cloud contamination issue. Though simple to complex computational methods for data interpolation have been applied to recover cloudy data, all the techniques are subject to many limitations. In this paper, a novel Landsat Cloud Pixel Recovery (LCPR) method is proposed to repair cloudy pixels from the time-space-spectrum continuum with the aid of a machine learning tool, namely random forest (RF) trained and tested utilizing multi-parameter data. A case study in Apalachicola Bay is presented to evaluate the performance of LCPR to repair cloudy NDVI reflectance for two specific dates. The RF based LCPR method achieves a root mean squared error of 0.09 sr\(^{-1}\) between predicted and observed NDVI reflectance values. Findings suggested that the LCPR method is effective to repair cloudy values and provide continuous and quantitatively reliable imagery for further analysis in environmental applications.

Major: Civil Engineering

Educational Career:
Bachelor's of Urban and Regional Planning, BS, 2009, Bangladesh University of Engineering and Technology
Master's of Environmental Science, MS, 2014, Florida International University

Committee in Charge:
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Arvind Singh, Civil, Environmental and Construction Engineering
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Approved for distribution by Stephen C. Medeiros, Committee Chair, on March 31, 2016.

The public is welcome to attend.