A New Spectral Index for Terrestrial Oil Spill Detection based on UAV Imagery

Masoud MAHDIANPARIA,*, Bahram SALEHIA, Saeid Homayounib, Fariba MOHAMMADIMANESHb

a C-CORE, and Memorial University of Newfoundland, St. John’s, NL, Canada
b Dept. of Geography, Environment and Geomatics, University of Ottawa, ON, Canada

* m.mahdianpari@mun.ca

ABSTRACT:

Remote sensing technologies provide a broad range of analytical techniques and data for various environmental applications and disaster management. Oil spills is one of the most threatened environmental issue, which has economic and environmental implications. Thus, there is an urgent need to develop a method for detecting oil spills with less human involvement. While the value of Earth observations data have been well reported and operationally applied to maritime oil spills, it has been less investigated for terrestrial or land-based incidents. Recently, there has been much attention on terrestrial oil spills detection using remote sensing tools due to numerous oil/waste water spills events in areas such as Alberta, Canada. The traditional approaches for oil spills monitoring are mostly destructive, time- and cost-consuming, which contrast with remote sensing technologies. Optical remote sensing images have demonstrated a great potential to be used for investigating of the pipeline leakage on the terrestrial regions.

This study aims to address a land-based oil spill detection using the Unmanned Arial Vehicle (UAV) remote sensing data. For this purpose, spectral image data were collected in visible and infrared spectrum from an affected area in Clear Hills, Alberta, Canada. At the same time, in-situ observations, e.g., soil apparent Electrical Conductivity (ECa), were collected by the widely used conductivity meters EM-31 and EM-38 instruments. EM surveys, which use an instrument called an electromagnetic induction meter, transmit an electromagnetic wave toward the ground and determine soil conductivity as well as salinity. After preprocessing of both UAV and ground observations, spatial correlation analysis was carried out to determine the most and less sensitive spectral bands to oil polluted soils. Importantly, a new index was proposed and evaluated based on the correlation between UAV bands and EM data. The details of analysis and final results will be presented in the full paper.

Keywords: Oil Spill detection, Unmanned Arial Vehicle (UAV), Remote sensing, Correlation analysis, Electrical conductivity.