MiniLab – Reflectance Spectra

ES315 GIS/Remote Sensing

By Katherine McCarville, Upper Iowa University, mccarvillek@uiu.edu

Purpose and Objectives

--Gain an understanding of the wavelengths of visible light, and the parts of the electromagnetic spectrum that are not visible to the human eye.

--Learn the difference between active and passive remote sensing techniques.

--Create reflectance spectra for various objects, both indoors and outside

--Compare your reflectance spectra to published reflectance spectra

--Understand the basis for analysis of Landsat imagery, especially indices such as NDVI

--Published reflectance spectra (reflectance spectrum plot for spinach is in the ALTA booklet)

Materials

--ALTA reflectance spectrometer

--Computer with Excel software

--Standard white card for photography, or white cardboard or heavy paper (high brightness, at least 88)

--Several leaves of different colors, including a geranium leaf, variegated coleus leaf, begonia leaf, brown (dead) leaf, yellow leaf

--Several colors of printer paper, including neon shades if possible

Work with your partner. Turn in your results as an individual lab report on the MyUIU portal.

Taking a Reflectance Spectrum

1. First, turn on the ALTA spectrometer and record the dark voltage when no lamps are illuminated. \_\_\_\_\_\_\_\_\_\_\_ = Dark voltage
2. Look at the geranium leaf. What do you expect the reflectance spectrum for this leaf might look like? Sketch a graph of it here:

1. Use the geranium leaf and record the reflectance at each of the ALTA wavelengths on the Worksheet for Calculating Reflectance. Graph your results on Graph Template 1. Compare your results to the reference spectrum for spinach.
2. What anomalies do you observe? List them here:

1. The ALTA’s different LEDs are of different brightness, and the light sensor is most sensitive to red and infrared light, and least sensitive to violet light. Does this help explain the anomalies? Explain.
2. You’ll need to standardize your data. Use the “Standard” white card, which reflects about 85% of ALL light that hits it. Record the spectrometer readings for each of the ALTA wavelengths. Now, you can standardize the results from the geranium leaf, and calculate the percent reflectance for each wavelength. Use the Worksheet for Calculating Reflectance.

(Display voltage for sample – dark voltage)

% reflectance = ----------------------------------------------------------- \* 100

(Display voltage for standard – dark voltage)

Graph all the remaining data as reflectance spectra, on Graph Template 5.

1. Collect data and graph reflectance spectra for the leaves that are provided, including the geranium leaf. Compare your reflectance spectra for leaves with the reference spectrum for spinach. Discuss and explain any differences.
2. Collect data and graph reflectance spectra for the paper samples that are provided. Discuss and explain the differences between these.
3. Go outside to collect data for reflectance of snow, concrete, rock, metal and glass. Graph your data as reflectance spectra. Discuss and explain any differences among these.