GEOGRAPHY 827 NAME_____
DIGITAL IMAGE PROCESSING AND ANALYSIS FALL 2015

LAB EXERCISE NO. 08 **DUE DATE: 11/17/2015**
Points: 5

TOPIC: SPECTRAL TRANSFORMS AND ANALYSIS

Purpose: To familiarize with spectral transformation and information extraction in the feature space using specifically PCT, TCT, VI, and FC techniques you learn from the class

Procedures:

1. Load "Landsat_surf.img" into ERDAS IMAGINE (you should work on the surface reflectance from previous labs).
2. Click on Raster\Spectral\Principal component and conduct a **Principal Component Transform** using input image. Write to a file of eigenvector matrix and eigenvalues. Make sure you do this in your directory. Run the model for the first 6 PCs. Note: make sure you use the float format as output. Examine the PCT image and answer the questions below.
3. Conduct a **Tasseled Cap Transform** using the same image. Remember to examine the transformation coefficients. The software we use has only one set of TM TCT coefficients. You need to write them down and compare them with those from PCT. Again, use float out format. Here, think about why we need to use float instead of the default integer format?
4. Build a model of your own to compute NDVI from the image provided. Use float output format.
5. Build a model of your own to compute SAVE using L=0.5 from the same image provided. Use float output format.
6. Compare NDVI, SAVI, PC1, PC2,, TC1, TC2, images you just generated and answered the questions below,
7. Scale the NDVI value by the following equation to estimate percentage fractional cover of green vegetation:

    a. $fc \frac{1}{NDVI_{full\ canopy} - NDVI_{bare\ soil}} (NDVI - NDVI_{bare\ soil}) * 100$

    b. Where the $NDVI_{full}$ canopy is a NDVI value of a field full of vegetation while $NDVI_{baresoil}$ is the NDVI value of bare soil field (fields void of vegetation). You need to load a NDVI image and select two fields and obtain values from these two fields before you put them in a spatial model to compute green fractional cover.

8. Compare the fractional cover with PCT image and answer the questions below.

Questions: Based on the analysis of NDVI, SAVI, PCT and TCT images, answer the following questions. Type your answers in a separate file.

9. What "features" does the first, second, third, and fourth PCT component highlight?

10. How does your PCT coefficients compare with the TCT coefficients from those provided in the case for Landsat TM image? If different, why?

11. How much variance does the first, second, and 6th principal component explain? Calculate the percentage values assuming the total variance is contained in all 6 components.

12. What are the statistical differences (histogram, mean, SD, min, max, etc.) between NDVI and SAVI images? Can you explain?

13. Compute the fractional green cover of the scene. Can you spot any places where the fractional green cover is lower (or higher) than what you had expected? If so, explain why.

14. Compare the fractional green cover image with the PCT image. Which PCT component is mostly correlated with fractional green cover, by visually examining the two images? Check several points so examine the correlations quantitatively, i.e., use the cursor (crosshairs) to examine the values of few places to see if they are correlated. Use no more than 10 points.

15. As a bonus, open your *fc in ArcGIS* and apply an appropriate color ramp that reflects continuous data.