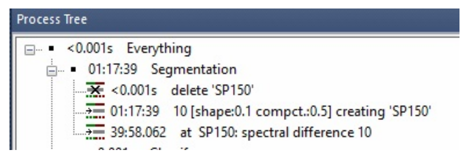
# GEO 427/EVS 527
# Exercise 9: Object-Based Imagery Analysis III

Now that you have done both segmentation and classification on a relatively simple image, it's time for you to do something more realistic. There is a directory on your S: drive entitled Chagrin. It includes a shapefile of the larger rivers in the Chagrin River drainage within Cuyahoga County, a DSM and DEM of the area, a CIR image of the area from the leaf-off period of 2006, and three RGB images, two of which are NAIP images and one is from OGRIP. First, copy the entire Chagrin directory onto your X: drive. You should look at all of these images and make sure that you understand what each does and does not contain. You will need most of these images, but you won't need them all.

Create a new project in eCognition. You will use it to examine some of the characteristics of ecosystems in the vicinity of the Chagrin River. In the first of these OBIA exercises, you examined the role of spectral attributes in defining the details of objects. In the second, you examined the role of geometry. In this exercise, you will combine these attributes with relative position.

When you are inserting your images into your new project, place the CIR and one of the RGB images at the top of your project. This will give you 6 layers, 3 from each image. Then insert the DEM and the DSM. You should *not* layer-stack these images into a single image file. Finally, insert the shapefile as a thematic layer.




Build a process tree similar to the one at right. You should think about the most useful scale parameter, and after you view the talking head, you might prefer one other than 150. You should, however, have the three levels of the process tree shown. The first step (delete) insures that the segmentation begins from a clean slate. The second (multiresolution segmentation) does the primary segmentation. The third (spectral difference segmentation) joins the objects that have similar characteristics. You should give some thought to the multiresolution segmentation. For example, do you want to consider all of the layers in the image? Do you want to include the thematic layer? In the talking head, I used only the reflected-light images, omitting the DEM, DSM, and thematic layer. You may wish to do the same, but you don't have to.

You will notice, when the segmentation is complete, that the river is fairly well defined. Because we are interested in the river's flood plain, your first class should be the river itself. There are two aspects to the river that must be considered. First, the river comprises water, so you will need to identify a class of object termed 'water.' You may wish to examine what parameters describe water in your images; you may prefer to compute the membership functions in the samples editor. The choice is yours. In the talking head, I used the samples editor, but both approaches are equally valid. Note that not all examples of 'water' belong to the well-developed river system. You will need to identify a second class of water which might be termed 'river' to include the water objects that are positioned very close to the line in the thematic layer. Add a classification function to your process tree that first classifies water objects and then ascribes the appropriate water objects to the river system.

In the process of creating these objects, you will need to define several parameters that aren't obvious. You will almost certainly discover that the layers of your image aren't initially available to you; nor is the distance to the thematic layer. You will have to use the "Create new 'mean'" to identify the mean value of each layer. You should certainly define the mean values of the layers from your reflected-light image files, although it wouldn't hurt to define the mean values of the DEM and DSM as well, since you will need these later. To find the distance from the thematic layer, you will need to go to Object Features -> Position -> Distance -> Distance to Vectors -> Create new 'Distance to Vectors'. Then you will define the distance from either the centroid or the boundary of your object to the line in the thematic layer as the parameter of interest.

Once these parameters are defined, you can use the samples editor to define the membership functions for the Water and River objects. Add the appropriate classification steps to your process tree, and evaluate the objects for the Water and River classes.

You should then calculate the mean NDVI and NDSM values for each object. This is done buy going to Object Features -> Customized -> Create new 'Arithmetic Feature.' When the dialog box opens, you can calculate the NDVI as (Layer 1-Layer 2)/(Layer 1 + Layer 2) from the CIR image (note that you can't calculate the NDVI from an RGB image, but you can get a similar result by using the Layer 2/Layer 1 (i.e. Green/Red) band ratio, and the NDSM is (DSM layer - DEM layer).

You should be able to estimate the presence of vegetation from the NDVI (you might want to use Feature View to get a feeling for the values of NDVI in various places, vegetated and not vegetated), so that you can develop an appropriate membership function for vegetation in general. Since you're also calculating the NDSM, you can differentiate trees from grass and shrubs within the general Vegetation class.

You can also define the flood plain of the river. It isn't very wide in the area of your image, so it's pretty easy. Basically, a flood plain is pretty flat. This means that if you look at a flood-plain object, you would expect the DEM to have a mean elevation value fairly close to that of the river nearby and a very low standard deviation. Steeply sloping land, on the other hand, would have a somewhat higher mean elevation value and a much higher standard deviation. If you go to Object Features -> Layer Values -> Standard Deviation -> Create new 'Standard deviation,' you see that you can calculate an object attribute for the standard deviation of the DEM layer. If this is suitably low, and if it is relatively close to the river (or to a River object), you can regard it as flood plain. If you wanted to be more thorough, you could add some other attributes to this definition, but this is sufficient for this exercise. Add an appropriate classification step to your process tree, and execute it to find the flood plain. When you're defining the classification step, however, you should consider the class filter to be evaluated, and whether you wish to separate flood-plain grass, shrubs, and trees from non-flood-plain grass, shrubs, and trees.

When you are done, you should have a viable process tree and a map that provides a wealth of information about the ecological characteristics of this portion of the Chagrin River watershed. You may wish to add details about the urban areas surrounding the more natural portions of the watershed (much of this area is in the North Chagrin Metropark); that is up to you.

**Portfolio**

12-1 Process tree that segments the study area for this exercise and identifies the classes you chose.

12-2 A verbal discussion of how you organized the image you segmented in step 12-1 and how you defined the classes you ended up with

12-3 The map produced from your process tree.