CSE 509A
Problem Set 1  (due Tuesday, Jan. 20)

1. Examine photo #1. Draw an outline around the edge of each identifiable object in the scene. Make a list of the objects outlined, and give each a proper semantic name (e.g. “plant type #1” or “plant, angel wing begonia”, or “tree”, or “deer”, etc.). Some objects in the image may be separated parts of the same scene object, and should be labeled the same (“plant #1, part 1”, “plant #1, part 2”, etc.). The outline may be drawn on a paper print of the photo, or constructed using GIMP or any suitable digital drawing or image processing tool.

<photo #1 - deer image #1>

2. Transfer the outlines drawn in problem #1 to a digital image containing only the outlines, with a black or transparent background. Call this the boundary image for for photo #1. You may directly construct (draw) the boundary image, if you wish, as part of problem #1. Use pixel colors in the outlines to indicate object identity, by associating colors to entries in the object list from problem #1.

3. Produce a black/white image of the boundary image, where each pixel is white if it is labeled, and black if not labeled. Combine your b/w boundary image with photo #1 to produce a photo with outlines, so the accuracy of boundaries (shapes and locations) may be exhibited.

4. Challenge: Produce a label image of photo #1 in which all pixels contained in the boundary for a specific object (or part) have the same label as the boundary pixels. Call this the segmented image. Pixels which are part of no object should be labeled as “background”, and given a value of zero. (This includes pixels which may be part of objects, but are too numerous or too indeterminate to identify as part of an object, but which for some reason may not really be “background”. At some point, it may be useful to have a label of “indeterminate” for pixels or aggregates of pixels.) Clearly, it would be preferable to do such labeling automatically, rather than by painting, but that’s what makes the a challenge. However, you may produce the segmented image by painting it, if you prefer.

5. Process the photo #1 by itself in GIMP (or any suitable app) to produce an image in which you can locate the deer.

6. Process photo #1 with photo #2 (a time-adjacent photo) to “find” the deer, where “find” means associate a pixel location with the portion of the image in which the deer image can be found. The location should be determined by producing a combined image in which evidence of the deer is visible (e.g. a difference image). The evidence image is part of the answer to this problem.