

Lab 9: Contour-based Segmentation



Primary Goal: Learn how to perform Chan-Vese (CV) segmentation.

Secondary Goal: Learn about supervised segmentation.

Download the image `shapes.png` from our course website under the Lab 9 section. Load this image into Matlab and convert it to grayscale using the `rgb2gray` command. Our goal is to perform Chan-Vese (CV) segmentation on this image with different initial contours.

First segment this image using a large circle in the center of the image. Start the code with a circle of radius 20 centered in the image and try a value $\lambda = 0.1$. If done correctly, you should segment both dark shapes (the heart and diamond) in the image.

In some applications, we want to segment a specific shape in an image. For example, a radiologist may want to segment just a tumor in a brain MRI rather than the entire brain. This may require user interaction, a process which we called supervised segmentation. (Segmentation that is done automatically by the computer is called unsupervised.)

Let's allow the user to pick a starting point on the image for the contour and create a small circle around that point. We can locate points clicked by the user using the `ginput` function. In your CV code, before you create the circle add the following code:

```
imshow(uint8(f));  
P = ginput(1);
```

This code will display the image and wait for the user to click 1 point on the image. The (x,y) coordinates of the point the user clicked will be stored in a vector (P(1), P(2)). Next modify your code so that the binary image D is a circle of radius 3 with center (P(1), P(2)). Then create the signed distance function u based on D as in Activity 9.

Show that you can now segment each of the three shapes separately:

1. Black heart
2. White circle
3. Gray diamond

Include pictures of each shape segmented individually.

What to Include in Your Report

1. *[5 points]* Write a paragraph explaining how you segmented the image. In particular, describe how you added user interaction to the segmentation procedure. Reference your figures in the text.
2. *[5 points]* Create a figure showing the 3 different segmentation results. Include a caption.
3. *[10 points]* Paste your Matlab code for CV supervised segmentation into a figure. Include comments in your code that describe the process. Include a caption.