CMP SCI 6420 **Image Processing and Computer Vision**
Assignment # 3 Due Date: April 06, 2021

Image Segmentation

Purpose

The purpose of this assignment is to segment a given image. You are given a map where areas (states or countries) are presented in different colors. You will use k-means clustering to extract different areas (states or countries) in the map.

Task

The map of continental US, to be segmented, is provided in Figure 1. Each state is represented by a color such that none of the two neighboring states have the same color. However, there may be instances, such as Michigan, where different regions of the state are separated by a water body. You should recognize two areas of the same color as a single state if they are separated by the background color only (white in Figure 1).

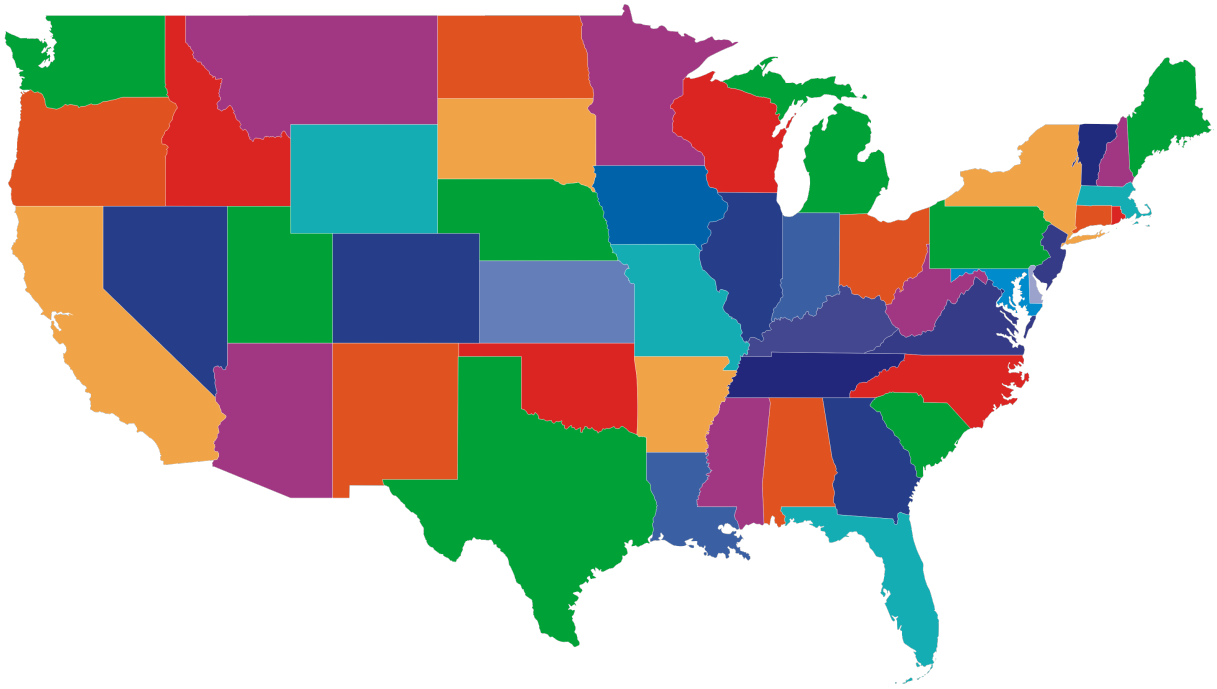

Figure 1: Map of the USA to be segmented

Increase the size of the state selected by the user and display it such that its centroid is coincident with the centroid of the original state. The state should be selected by the left mouse click.

Invoking the solution

Your solution will be invoked using the following command:

```
map_segment [-h] input_image
```

`map_segment`	Name of your executable
`input_image`	Name of file containing image with periodic noise

The parameters enclosed in `[]` are optional. You are free to use long parameter names such as `--help` for `-h`.

Suggested implementation steps

1. Parse the command line. You can create your own parser or use the class `CommandLineParser` provided by OpenCV. Each of the optional arguments may have a default value. If the user specifies the option `-h`, print a help message and exit. Otherwise, assign the suggested parameters from user inputs or default values.
2. Read the input image.
3. Display the image and receive the input (left mouse butoon click) from the user. Extract the state selected, zoom it to twice the size (preferably by using affine transform) and display it superimposed on the map with the centroid of the zoomed state coincident with the centroid of original state. Make sure that the zoomed state stays completely within the original image.
4. Terminate the program when the user hits the character `q`.

Criteria for Success

You should be able to successfully perform the steps outlined above.

Grading

I'll use the following rubric to assess your submission.

1. *Overall submission; 30pts* Program compiles and upon reading, seems to be able to solve the assigned problem.
2. *Command line parsing; 10pts* Program is able to parse the command line appropriately, assigning defaults as needed; issues help if needed.
3. *Show the zoomed in state; 60pts* Program is able to use affine transform to display the zoomed in state in appropriate location.

Submission

Submit an electronic copy of all the sources, `README`, Makefile(s), and results. Create your programs in a directory called *username*.4 where *username* is your login name on delmar. This directory should be located in your `$HOME`. Once you are done with everything, *remove the executables and object files*, and issue the following commands:

```
% cd
% chmod 755 ~
% ~bhatias/bin/handin cs6420 4
% chmod 700 ~
```

Do not copy-paste these commands from the PDF; type in those commands.