

# CS1115 Lab 9 (October 31, 2013)

Completing the lab is very important, but your work is not graded and it is not submitted. If you finish before the hour is over, then you can leave early or you can work on the "Finished Early" problems. If you do not finish the problems before the end of class, then be sure to ask enough questions so that you can complete the exercises in the next day or two on your own.

## 1 The Near to Centroid

Download `ShowBackbone.m`, `Cell2file.m`, and `1b18.dat` from the syllabus page. Run `ShowBackbone` to acquire a sense of the protein's geometry. Modify the code so that it produces a file `SortedProtein.dat` whose  $i$ -th line encodes the backbone acid that is the  $i$ -th closest to the centroid of all the backbone acids. Follow these steps:

1. Comment out the `ThreeDView(x,y,z)` command.
2. Produce a cell array `C` made up of those lines from `1b18.dat` that correspond to the backbone acids. In other words, `C{i}` should house the line in `1b18.dat` that corresponds to the  $i$ -th amino acid in the protein's backbone.
3. Compute the centroid of the backbone amino acids.
4. Compute a vector `d` whose  $i$ -th component is the distance from the centroid to the  $i$ -th amino acid.
5. Sort the distance data via `[ds,idx] = sort(d)` and understand what is encoded in `idx`.
6. Produce a second cell array of strings `D` that is a permutation of `C` with the property that `D{i}` houses the data for the backbone acid that is the  $i$ th closest to the centroid.
7. Study `Cell2File` and use it to produce `SortedProtein.dat`.
8. Use `ThreeDView` to display the "sorted" protein.

## 2 Clock Tower

Download `Cornell_Clock.jpg` from the Syllabus page. (a) Write a script that displays the image rotated 90 degrees clockwise. (b) Write a script that displays the image obtained by "shifting" the `rgb` values in each pixel. Thus, if the original `rgb` value at a pixel is `[10 30 200]`, then it becomes `[30 200 10]` in the new image. (c) We say a pixel in a black and white image is "dark" if its value is 127 or less and "bright" otherwise. Convert the clock tower image to black and white and modify it by replacing all dark pixels with 0 and all bright pixels with 255. Display the result.

## 3 Finished Early?

Let `p = [p1 p2 p3]` and `q = [q1 q2 a3]` be `uint8` `rgb` triples. The *distance* between them is given by  $|p_1 - q_1| + |p_2 - q_2| + |p_3 - q_3|$ . Define the `uint8` vector

```
colors = 255* [ 0 0 0; 1 0 0; 0 1 0; 0 0 1; 1 0 1; 1 1 0 ; 0 1 1; 1 1 1]
```

Notice that this encodes the colors 'k', 'r', 'g', 'b', 'm', 'y', 'c', and 'w'

Generate an image `Cornell_Artsy_Clock.jpg` from `Cornell_Clock.jpg` by replacing each pixel in the latter with the closest pixel from `colors`.

**Please delete your files from the computer before you leave the lab!**