

US Map

Objective: To use the StdDraw class, a simple database, and algorithms to create a map of the cities in the USA.

Background:

Text files can provide us with a great deal of information. This assignment asks you to use data from two text files and the methods in StdDraw to create a graphical representation of the United States (the lower 48). Consider the following US map, with longitudinal and latitudinal lines shown.



These longitudinal and latitudinal lines are similar to x and y values in a coordinate grid. If we had graphical methods to draw the cities and could get location values for US cities, we could create a map of the United States.

The StdDraw class provides graphical methods to easily accomplish this goal. StdDraw can set the window size, scale the XY coordinates, and draw points for cities. The default window size is 512-by-512 pixels. The default lower left coordinate is (0, 0) and the default upper right coordinate is (1.0, 1.0). A link to the documentation of StdDraw features can be found on Mr Greenstein's web site (<https://introcs.cs.princeton.edu/java/stdlib/javadoc/StdDraw.html>).

We also provide city locations with a file containing longitude and latitude values.

Assignment:

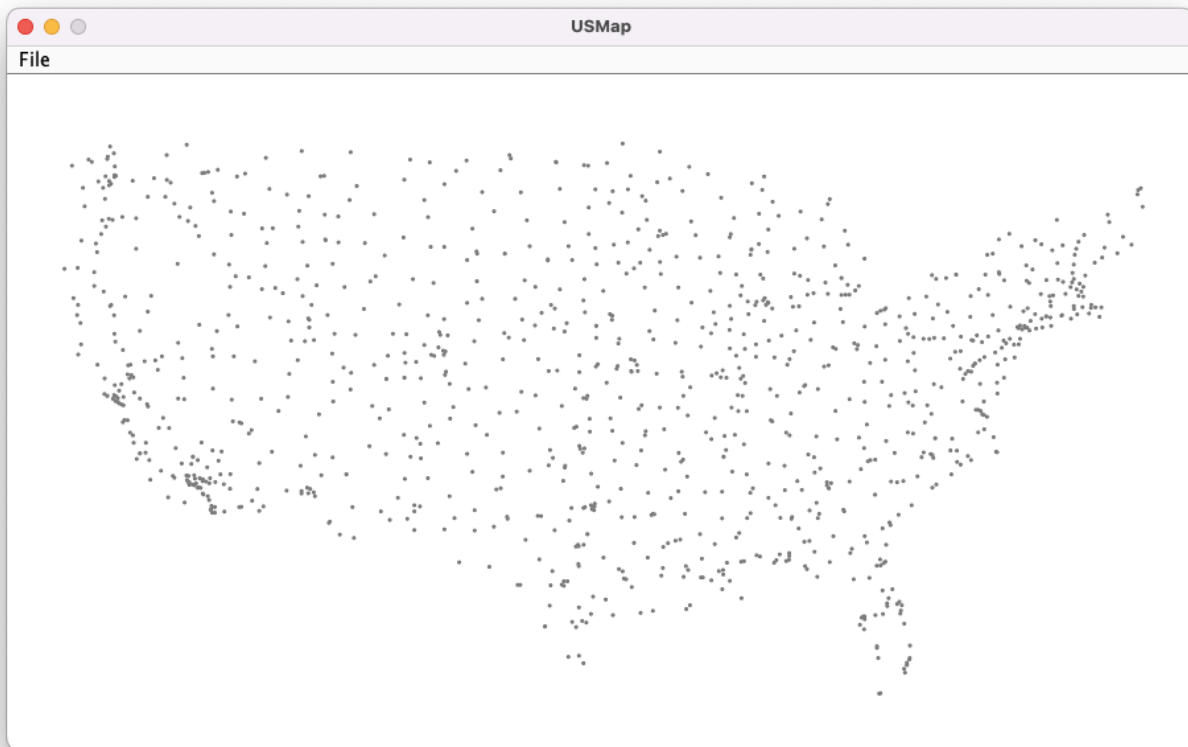
Download the **USMap.zip** file from Mr Greenstein's web site. It will create the directory **USMap** in which you will do all of your work. There are four files in this directory. **cities.txt** contains the latitude and longitude coordinates for over 1000 US cities. **bigCities.txt** contains the populations of the top 276 largest US cities. The **StdDraw.java** file contains the StdDraw class, and **StdDraw.webloc** contains the StdDraw documentation web site location. You will also need your **FileUtils.java** class we created together to read the files.

- 1) Create a **USMap.java** file that will contain your main program. Read in location data from **cities.txt** and create a simple database of cities.

2) Plot the cities in a window using StdDraw. The setup for the window is in the following code.

```
/** Set up the canvas size and scale */
public void setupCanvas() {
    StdDraw.setTitle("USMap");
    StdDraw.setCanvasSize(900, 512);
    StdDraw.setXscale(128.0, 65.0);
    StdDraw.setYscale(22.0, 52.0);
}
```

Notice that the `setXscale` starts with the larger longitude number on the left. This tells StdDraw that the x coordinates decrease from left-to-right just like on the map on the previous page. You do not need to do any scaling. Plot cities as gray points of point size 0.006. Your program should produce a map like the one below.



3) Now the hard part. **bigCities.txt** contains the populations of the largest cities in the USA. Read this file and match the populations to the cities in your database. Ignore the big cities that do not have location data. Change the plot so that the big cities are colored in blue and change their point size to

$$0.6 * (\text{Math.sqrt}(\text{population})/18500)$$

For the largest 10 cities, color them red and change their size. You should produce a map like the one on the next page.

