

CPSC 446/546
Assignment 5
Due 11/18/2019, 11:59 pm

Upload to Canvas as a zip file named

yourfirstname_yourlastname_5.zip.

This assignment requires you to develop visualizations using D3. Do your own coding using examples given in the Scott Murray textbook or Mike Bostock's examples <https://bl.ocks.org/mbostock>. **Do not use any other code from the internet that you may find that creates visualizations similar to those required in problems.** If we find that code you use for a solution is taken from another internet source, you will receive a zero for the entire assignment.

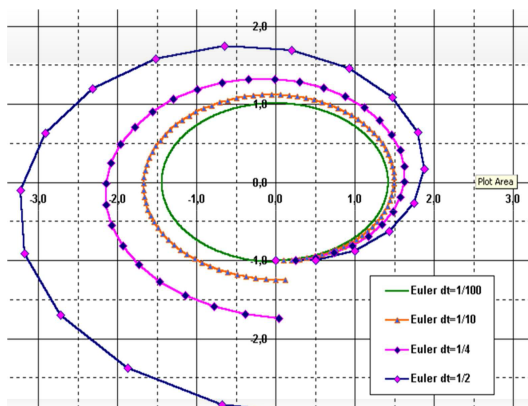
Be sure to edit your files to include the version of d3.js that is used in the examples in the Murray book. You can find this on Canvas, under files, in the d3-book-2.0.3.zip file.

As in previous assignments do not worry about getting pixel accurate results to match examples. You may use <https://developer.mozilla.org/enUS/docs/Web/JavaScript/Reference> to do tutorials and look up syntax.

Note that some parts of the questions are for all students. **Questions 1 and 3** have additional work for **CPSC 546** only.

1. Arrange Spatial Data -- Vectors (34 pts)

a. Produce a plot of Euler integration for the velocity field defined as $[-y, (1/2)x]$ at each location $[x,y]$. Allow the user to enter a step size between 0 and 1.0 using a slider. Show the result as a path with the computed points marked on it as in this example from class:



As in the example, start the path at $(0, -1)$, and show the field for x and y ranging from $[-3, -3]$ to $[3, 3]$. Unlike the example you only need to show one path at a time. You may use a different style to display the background grid.

(546 ONLY) b. Produce the same plot for the same field as in part a.), but use 4th order Runge-Kutta integration (equation for $y(t+dt)$ has same form as x):

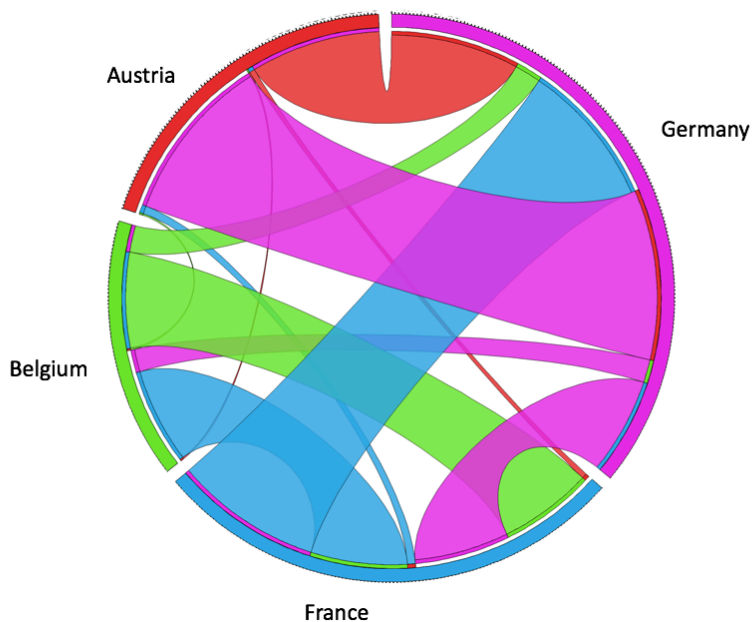
$$x(t+dt) = x(t) + 1/6 (k_1 + 2k_2 + 2k_3 + k_4)$$

where:

$$k_1 = dt * v_x(t); \quad k_2 = dt * v_x(x(t) + k_1/2)$$

$$k_3 = dt * v_x(x(t) + k_2/2); \quad k_4 = dt * v_x(x(t) + k_3)$$

2. Arrange network data (33 pts) -- A chord diagram shows relationships between categories that are represented as angles on a circle with "ribbons" that connect the categories. The width of the ribbons represent the magnitude of interaction between the categories. In the diagram below, migration between four European countries is shown. The ribbon widths are the number of migrants, and the color of the ribbon is the country the migrants are moving to. In this instance we see that migration to and from Austria is mainly with Germany, and migration to and from Belgium is mainly with France. Create a chord diagram for some subset of the migration data given in the file from the UN included with this assignment. You can extract the data for a small number of countries using any method you choose. You can include the data in your html file or you can read it in from a file that you construct.



The data for this was:

Country	Austria	Belgium	France	Germany
Austria	0	2 201	7 665	191 269
Belgium	2 540	0	139 529	39 225
France	11 610	141 648	0	215 982
Germany	249 001	33 783	140 948	0

Notes:

A very elaborate chord diagram for migration can be viewed at :

http://download.gsb.bund.de/BIB/global_flow/

You only have to create a simple static diagram that shows the chords

For help with chords in D3 see:

The D3 API: <https://github.com/d3/d3/blob/master/API.md#chords-d3-chord>

Example by Mike Bostock: <https://observablehq.com/@d3/chord-diagram>

A tutorial <https://d3indepth.com/layouts/> (scroll to the bottom)

3. Geographic visualization (33 pts) The map below is [d3-book-2.0.3/chapter_14/06_points.html](#) plotted with points that represent (approximately) each states centroid (from [statecentroids.csv](#) that comes with this assignment), instead of cities. Using [06_points.html](#) and the centroids as a starting point, plot two values for each state (one encoded with color, one with the size of circle) from www.census.gov. You can choose any data for each state that you like (population, housing etc.) One possibility is taxes collected

<https://www.census.gov/content/census/en/data/tables/2017/econ/stc/2017-annual.html>

(a sample is included with this assignment).

Some of the centroids aren't very good (such as Michigan and Florida), and you can update these manually if you would like.

(546 only) Create a second map of the US, but instead of a circle create a glyph for each state that encodes 2 or more data values (e.g. for tax data each state could be colored by total taxes, and the glyph could represent income from types of taxes such as property and income tax.)

