Programming Assignment 4
Creating a Multi-Line Chart (7 points + Bonus Points for Extra Credit)
Due Date: Feb 12, Monday, 11:59pm
(Assignment must be demoed and explained in person to receive any credit)

Your task is to create an animated multi-line chart for 6 countries (BRICS – Brazil, Russia, India, China, South Africa, and USA) from the data that we have provided: data.csv. This data file contains Energy Consumption per Capita in Million BTUs per person for 11 year period from 2000 to 2010 for a large number of countries.

Your visualization must be clear (neat and elegant without clutter) and understandable. This means that x-axis and y-axis be properly labeled with appropriate tickmarks. The graph must have a title. An example of the final output with animation will be shown in the class.

Your task may be simplified if you prepare a **new dataset** by *deleting the extraneous data* and *transposing rows and columns* to create a new data set in csv format similar to the ones used in References [2,3] with 7 columns and 12 rows where the top row is reserved for country names and the leftmost column stores the years. *Call this new data set BRICSdata.csv.*

In order to create this visualization, you may have to learn and utilize a few new features of D3:
   (i)   *d3.extent* (compute domains) used in [2]
   (ii) *d3.line* (display line shape) used in [2]
   (iii) *d3.scaleTime* (encoding time along x-axis) used in [2]
   (iv) *d3.parseTime* (parse date) used in [2]
   (v)   *d3.map* (copies properties from an object into a map) used in [3*]*

In addition, your visualization should have the following features:
 1. Some basic visualization without any of the features described below in 2-6: (also some partial credit for cluttered semi-functional visualization to recognize effort that did not come to fruition)
 2. Names of countries must appear next to the lines as in Multi-Series Line Chart (Reference [3]).
 3. Each line should be **interpolated** using "curveBasis" or some other interpolation mechanism appropriate to the data (Reference [3])
 4. Color associated with each of the six lines must be different (use **d3.schemeCategory10** to define color scale.
 5. **Thin grid line** (as shown in line graph of Apple's stock prices shown at the end of this document). This can be achieved by creating style sheet associated with grids, creating new functions gridXaxis, gridYAxis, and then calling these functions with appropriate parameters.

6. Add animation/**transition** to the lines as shown in the class similar to Reference [4] on "Animate path in D3".

Bonus Points: up to 5 points if you add some or all of the following features:
1. **Annotation:** using arrows and associated text (creating arrows and placing text pointing out some important insight on data. (2 bonus points)
2. **Update** the line charts by changing one of the six countries to a new country (or adding one additional country) through a click (see Chapter 9 of the textbook; also requires loading additional data). (3 bonus points)
3. Keeping **data format** so that countries are listed in a column and time data is stored in rows (as provided in the original file), that is, you do not have to transpose rows and columns. You may still have to delete extraneous data. (3 bonus points)
4. Any extra "cool" features (make sure that cool does not make the multi-line chart look worse; if unsure, ask the instructor) (x points)

Extra credit must be attempted alone (and not in pairs). If you attempt extra credit, please submit *additional* files with suffix Extra added such as MultiLineExtra.html etc. Extra credit submissions must be demoed to the instructor in person.

Resources/References (concepts/code needed to complete the assignment):
1. Bar graph example and code (provided on ecommons)
2. Line Chart by Mike Bostock http://bl.ocks.org/mbostock/3883245 (discusses d3.extent, d3.line, d3.scaleTime, d3.timeParse)
3. Multi-Series Line Chart by Mike Bostock http://bl.ocks.org/mbostock/3884955 (discusses,in addition, d3.map, d3.columns.slice, d3.curveBasis, and d3.schemeCategory10)
4. Animate Path in D3 http://bl.ocks.org/duopixel/4063326 (this code has a mechanism for animating paths)
Additional Reference on Animation: This reference is older and uses D3 V3 version (so, you may have to translate this to D3 V4 version if you use these ideas)
Notes on Animating Line Charts with D3 http://big-elephants.com/2014-06/unrolling-line-charts-d3js/

Submission Requirements
Submit four separate files titled:
• index.html
• stylesheet.css
• MultilineChart.js
• BRICSdata.csv or any other data files
• MultiLineExtra.xxx (optional for bonus points)
Please do not submit zip files. Please make sure that you use the following script command in your html file to link to D3:
<script type="text/javascript" src=http://d3js.org/d3.v4.min.js></script>
Please submit structured well organized code and insert comments generously.

This may be a non-trivial assignment and requires learning a few new commands. It is strongly recommended that you get started on this assignment as soon as possible!

Example of Thin grid lines: