ASSIGNMENT: Line Drawing - Shapes and Curves

Due Mar 2 by 10pm **Points** 40 **Submitting** a website url
Available Feb 21 at 8:15am - Mar 2 at 10pm 10 days

This assignment was locked Mar 2 at 10pm.

Assignment 1

2D Line Drawing - Shapes and Curves

Task

Use line drawing to create a slide show of shapes using HTML's Canvas 2D API. The slide show will have 4 slides.

Shapes / Curves Slide Show (40 pts)

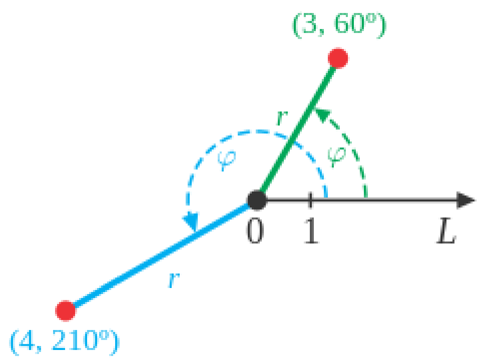
- Slides **(32 pts)**
  - Slide 0: Rectangle **(8 pts)**
  - Slide 1: Circle **(8 pts)**
  - Slide 2: Bezier curve **(8 pts)**
  - Slide 3: Draw your name - must use at least one straight line, one circle, and one curve **(8 pts)**
- User controlled options **(8 pts)**
  - Number of sections to divide circles/curves into **(4 pts)**
  - Ability to show / hide points used in drawing routines **(4 pts)**

Note: all shapes will be outlines (i.e. the rectangle and circle will not be filled in).

Circle

As with many things in Computer Graphics, you will not render a perfect circle. Rather, the goal is to efficiently approximate a circle while making it nearly visually indistinguishable from an actual circle. Therefore, circles can simply be drawn as an *n*-sided polygon. The larger the value of *n*, the closer the polygon looks to a circle.

In order to get *x*,*y* coordinates for the circle-like polygon's vertices, it is helpful to use polar coordinates (defining points on the circle in terms of the circle's center, its radius, and the counter-clockwise angle away from the positive-*x* direction).



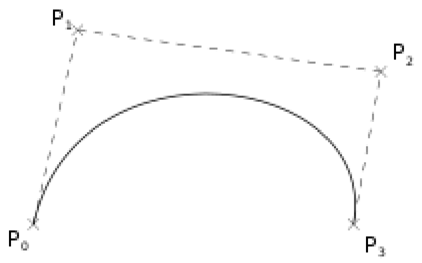
The center and radius remain constant for a circle, but the angle changes for various points around the circle. In order to convert polar coordinates back to Cartesian *x*,*y* coordinates, the following equations can be used:

$$x = center_x + radius \cdot \cos(\varphi)$$

$$y = center_y + radius \cdot \sin(\varphi)$$

Bezier Curve

Similar to the circle, in order to give the visual appearance of a curve, we will actually draw a sequence of short connected lines. A Bezier curve is a type of curve defined by its two endpoints and two other control points. The two control points define the tangent of the curve at each endpoint and have the effect of controlling the shape of the curve.



Points along the curve can easily be found when using parametric equations (defining *x*, and *y* separately in terms of the distance *t* along the curve - where *t*=0.0 is the starting endpoint and *t*=1.0 is the ending endpoint).

$$x = (1-t)^3 \cdot P_{0_x} + 3 \cdot (1-t)^2 \cdot t \cdot P_{1_x} + 3 \cdot (1-t) \cdot t^2 \cdot P_{2_x} + t^3 \cdot P_{3_x}$$

$$y = (1-t)^3 \cdot P_{0_y} + 3 \cdot (1-t)^2 \cdot t \cdot P_{1_y} + 3 \cdot (1-t) \cdot t^2 \cdot P_{2_y} + t^3 \cdot P_{3_y}$$

User Controlled Options

There is a user interface for users to control the number of sections to use for curves (including the circle), and whether or not to show point data. Your curves should be composed of the number of sections that the user selects (i.e. as the user changes the number of sections, your curves will look smoother or more jagged). Additionally, you should render all point data if the checkbox is selected. This can be done by drawing a small square or circle at each point used in the drawing routines (also show the control points for Bezier curves, but use a different style [color, shape, ...]).

Starter Code

Starter code is available on GitHub: cg-shapescurves (https://github.com/tmarrinan/cg-shapescurves). Please **fork** your own version of the code, then enable GitHub Pages in the project's settings (change *Source* from *None* to *master branch*).

You will need to edit renderer.js to implement drawing routines for the 4 slides.

Submission

Code should be saved in a repository on GitHub. In order to submit, you should enter the the project's live website URL for the assignment in Canvas. Note that this URL should take you to the actual application, not to the list of code files.

You should also submit a checklist of what you feel you have accomplished from the rubric above, and include your total expected score. This can be made as a comment once you submit the URL.

Deadline

This assignment is due Wednesday, March 2 at 10:00pm.