

Project 1: Keyframe Interpolation

Due: Jan 25, 2019, 11:55PM

In this project, you will implement an interactive program to demonstrate three different types of interpolation. The program lets the user add 2D control points on the screen by left-clicking the mouse and delete the most recently added control point by right-clicking. The resulting curve will be updated immediately on the screen after any UI event. You will implement the following three curve/spline types:

Cubic Bézier (splined together with C0 continuity, you will need $4 + 3 * i$ keyframes, where i is an arbitrary nonnegative integer)

Catmull-Rom

B-spline (defined by de Boor points)

The user can also switch between types of curves by using keyboard:

'l': linear interpolation (provided by the skeleton code)

'b': Bezier curve

'c': Catmull-Rom

'd': B-spline using de Boor points

'C': Remove all control points

Skeleton code

The skeleton code handles basic UI and visualization for you. After you successfully build it, try it out by giving different UI commands. You will find that the only interpolation that is working is the linear interpolation. However, the functionalities of left-click, right-click and keyboard control are already implemented for you.

Installation on Linux and Mac:

1. Download the skeleton code for mac and linux.
2. In terminal, go to the directory containing the downloaded code.
`cd 'path_to_downloaded_skeleton_code'`
3. Unzip the code and go inside the directory.
`unzip Project1_Mac-linux.zip`
`cd cs4496Proj1`
4. Compile and run the code.
`make`
`./main.out`

For Linux users: If the compiler says it can't find GL/gl.h, try installing freeglut library by:

Ubuntu# `sudo apt-get install freeglut3-dev`

or

Fedora/RedHat# `sudo yum install freeglut-devel`

If you have any questions or issues, contact the TAs.

Installation on Windows:

The skeleton code is built for VS2013, but the TAs have tested on VS2015 and VS2017 without any issues. When you open `cs4496P1_sln.sln`, you may see a message informing you that the project will be upgraded to a newer version of VS, but it should be done automatically without errors. You can switch between “debug” mode (supports break points) and “release” mode (runs faster) by selecting from the drop down in the toolbar. If you have any questions or issues, contact the TA:

Extra points

1. For each curve, you can implement support for "wrapping," which means that the curve has C0 continuity between the end point and the beginning point both in x and y coordinates (1 point).
2. Implement a C2-Interpolating curve (3 points).
3. Support UI that modifies the position of the control points by click-and-drag (1 point).
4. Support UI that deletes any control point by right-clicking on it (instead of always deleting the last point) (1 point).
5. Make b-spline start and end at the first and last de Boor points (1 point).

Submission Instructions**Mac/Linux Users:**

- 1) Clean up the folder using "make clean"
- 2) Zip the directory containing your code and submit this zip file to Canvas

Windows users:

- 1) Zip the folder containing the .sln file.
- 2) REMOVE the following files and directories from the .zip file :
 - cs4496P1_sln.sdf
 - cs4496Win_Project1\GL
 - cs4496Win_Project1\Eigen
 - cs4496Win_Project1\Release
 - cs4496Win_Project1\Debug

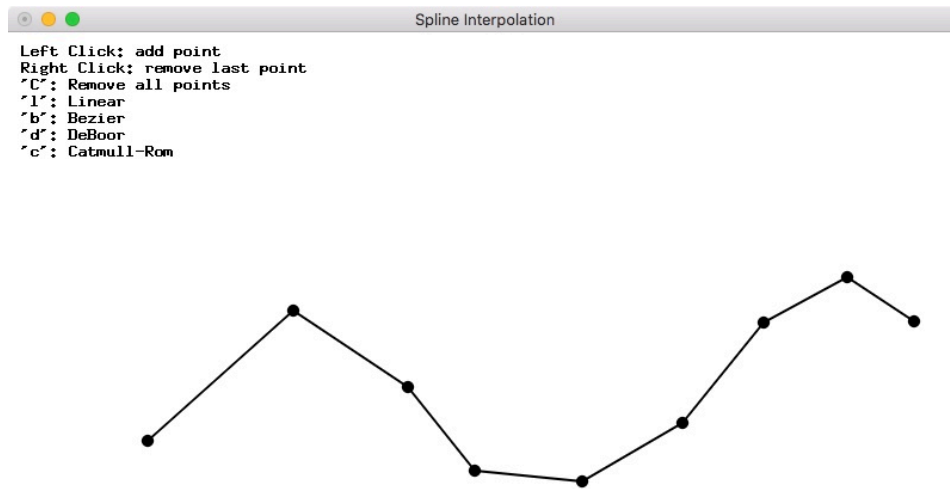
Your zip should be no larger than 5 MB in size. If it is bigger than this, you need to make sure you have removed all the aforementioned files and directories from your zip file.

- 3) Submit this .zip file to Canvas.

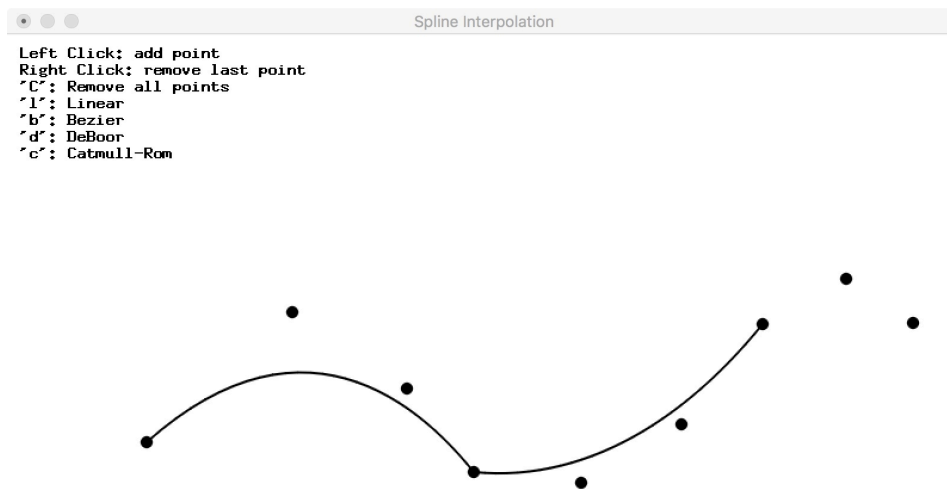
Solution examples

Here are a few images to demonstrate what each correct curve should look like for one example set of control points. You can qualitatively compare them with your solution.

Linear

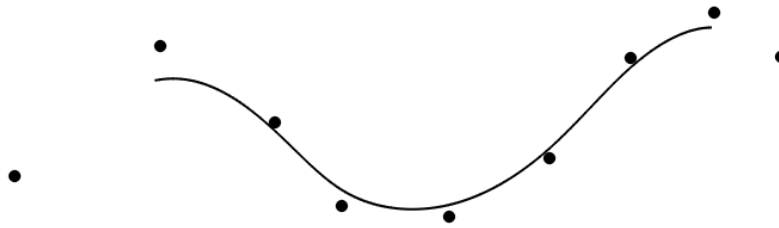


Bezier



B-spline

Left Click: add point
Right Click: remove last point
^C: Remove all points
^l: Linear
^b: Bezier
^d: DeBoor
^c: Catmull-Rom



Catmull-Rom

Spline Interpolation

Left Click: add point
Right Click: remove last point
^C: Remove all points
^l: Linear
^b: Bezier
^d: DeBoor
^c: Catmull-Rom

