CPSC 453 Fall 2019 Assignment 4

Introduction

This program implements an interactive environment for creating a pottery
by drawing its profile curve and lathing (a surface of revolution), the user can:

- Choose the method to generate the curve (Bezier curve/B-spline curve)
- Inserting, deleting and moving control points for a Bezier curve
- Inserting, deleting and moving points of a B-spline curve before subdivision
- Switch the viewport between profile/perspective/parallel projection
- Apply a pre-define checkerboard procedural texture on the model
- Adjust the direction of the directional light
- Save the model by its position of control points/points before subdivision as well as the corresponding type of curve as **.dat** files.
- Re-generate the model by loading **.dat** files.

Notice:

- The program has been tested in MS 239.
- The default number of points of Bezier curve generated by **de Casteljau's algorithm** is 1000.
- **The chasing game** subdivision scheme on a B-spline open curve will stop once the number of points generated >= 1000
- I assume that the pottery should be placed on a horizontal line so I restrict its profile such that in the xy-plane of NDC -1.0 <= x <= 0.0, -0.9 <= y <= 1.0
- If the curve is a Bezier curve, then points that the user edits are control points. If the curve is a B-spline curve, then there are no control points, the points that the user edits are points before **the chasing game** subdivision.
- In the profile projection, a red point indicates the center of the bottom of the pottery and it is **not** editable.
- OpenMP is used for acceleration in some for loops.
- Only **1** point can be selected at a time.

Install

- Initiate in a Linux terminal and change the current working directory to the root of ***Assignment4***
- Execute the following instructions to compile

```
cmake .
make
```

Arguments

- To show the usage, please run by

```
./assignment4.out --help
```

- To generate the curve by using different methods, please run by

```
./assignment4.out method_to_define_the_curve
# example: ./assignment4.out 1
```

- To generate the curve by a **.dat** file, please run by

```
./assignment4.out path_of_dat_file
# example: ./assignment4.out ./save/2019_11_27_14_27_55.dat
```

- The usage will be shown if any invalid arguments are provided.

Uninstall

You may clean the temporary output files by running

```
rm -rf CMakeCache.txt
rm -rf ./CMakeFiles/
rm -rf Makefile
rm -rf assignment4.out
rm -rf cmake_install.cmake
```

Usage

Keys and their functions

- ESC: Exit the program
- Z: Switch between zoom/rotation in perspective/parallel projection
- Q: Print the information of current context
- R: Reset the camera and the light direction in perspective/parallel projection
- T: Switch between applying/ not applying the procedural texture in perspective/parallel projection

- S: Save the current method to generate the curve and the position of all control points if the curve is a **Bezier curve** or the position of all points before subdivision if the curve is a **B-spline** to a file named with current time and **.dat** as its suffix
- 1: Switch to the viewport of the profile projection
- 2: Switch to the viewport of the perspective projection
- 3: Switch to the viewport of the parallel projection

To adjust the direction of the light

Suppose that the direction of the light is (x, y, z) in the world space, then

- 4: Increase x
- 5: Decrease x
- 6: Increase y
- 7: Decrease y
- 8: Increase z
- 9: Decrease z

In order to edit control points for a Bezier curve or points of a B-spline before subdivision in the profile projection

- Left-click a point to **SELECT** it
- Right-click everywhere to **DE-SELECT** the selected point
- When you have selected a point, you can press mouse left button + drag the point to move
- Press 'I' to enter the **INSERT** mode and press mouse left button to insert a point at the pixel clicked
- Press 'D' to **DELETE** the selected point