Programming Assignment #2 (Cow roller coaster)

out: Thursday May 30, 2024

due: Monday June 17, 2024 (24pm)

Objective:

Understand how to generate spline curves.

Developing environment:

After installing the necessary packages (python3, pil, glfw and numpy), any operating systems can be used.

Requirements:

1) Start from the skeleton code.
a. The code requires reading “cow.obj”. This file should be in the working directory.
b. “cow.obj” contains a triangle mesh.

2) Understand the basic structure of the skeleton code.
a. try to change viewpoint by typing 'space'
b. try to understand what parts of the source codes need to be changed. Keyword search for “TODO”.

3) Try to reproduce the demo video in the lecture video as closely as possible (except the color theme).
- First pick the cow by L-clicking the cow. Then, click the six control points for the cow’s trajectory. Whenever a control point is specified, the cow is duplicated at the clicked location. You can use L-dragging to adjust the cow’s height. After providing all control points, the cow starts to move following the roller coster track that connects from the first control point to the last control point, following a cyclic Catmull-Rom spline curve. The cow follows the track three times. After finishing the animation, go back to the initial mode where the cow follows the cursor.

4) glfw.get_time() function will be useful.

Submission guidelines:

1) Source codes of your solutions (Include a README.txt that specifies the files you made/changed)
2) To get the full marks,

a) Implements the UI for control point specification: 5pt
b) Implements vertical dragging (L-drag) as well as horizontal positioning (mouse-move): 5pt
c) Use the Catmull-Rom spline curve which is an interpolating spline: 10pt
d) Cow should face forward (yaw orientation): 5pt
e) Cow should face upward when going up (pitch orientation) : 5pt
f) When dragging, the pick-location on the bounding box should also be exactly on the cursor: 5pt.
- There are many different ways to calculate rotation angles or matrices. For example, you can use math.atan2 function, or you can also use a series of cross product operations.