

# Programming Assignment #2 (Cow roller coaster)

out: Monday May 29, 2023

due: Wednesdays June 17, 2023 (24pm)

## Objective:

Understand how to generate spline curves.

## Developing environment:

After installing the necessary packages (python3, pil, glfw and numpy), any operating system 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 the viewpoint by pressing '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 for 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 coaster track that connects from the first control point to the last control point, following a cyclic B-spline curve. The cow should complete three laps around the track. 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 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 cyclic B-spline curve which is an approximating spline: 10pt
  - d) Cow should face forward (yaw orientation): 5pt
  - e) Cow should face upward when going up (pitch orientation) : 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.