Logarithmic Spiral Generation for Smooth Camera Motion

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I. Overview

The logarithmic spiral is a mathematical curve also known as the golden ratio, growth spiral, golden section, and spira mirabilis. It was studied by Descartes and Torricelli in 1638 and again by Jacques Bernoulli 1654-1705. The curve originates as the inverse of an exponential curve. The pattern is found in nature and has been observed for its subjective beauty and aesthetic features. Some examples include plants, spiraled seashells, and many horns of goats, sheep, and other animals.

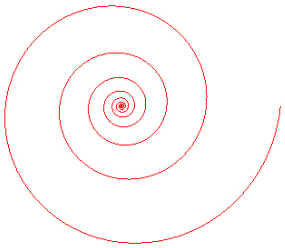


Figure 1: *logarithmic spiral visual example*

$$x = ae^{k\varphi}\cos\varphi, \qquad y = ae^{k\varphi}\sin\varphi$$

Figure 2: *Equation for a logarithmic curve*

II. Requirements

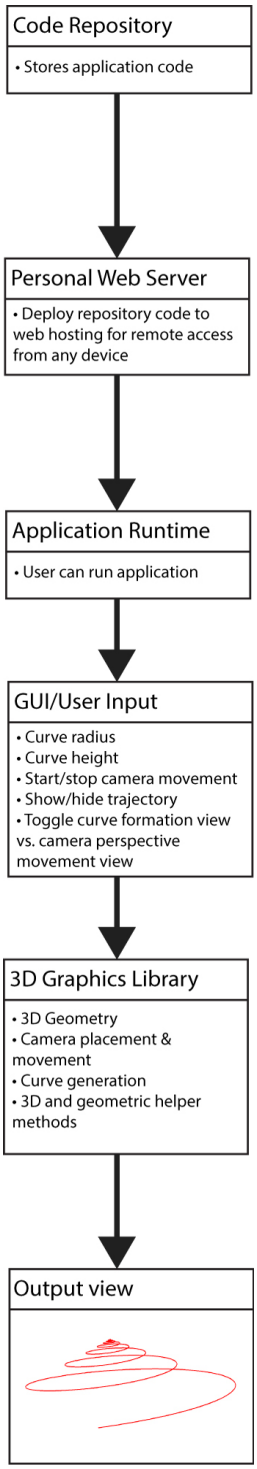
For my project, I will be implementing a curve for the log spiral in a 3D environment using Python. This curve has many uses for aesthetics in computing, whether it be to form animation rates, visual paths, or travel trajectories. In this example, I will provide a mechanism for the user to control the logarithmic output by adjusting specific attributes for the curve for his needs, such as spiral radius, height, and toggle visibility, along with any other relevant input attributes. The user will be able to view the spiral from a 3rd person view in order to form the spiral based upon his inputs. The output will form a resulting spiral that will be used as a trajectory to provide smooth camera motion. The spiral will surround a dummy example viewing object, and the camera will move along this path to provide smooth camera motion and ability to view the object from all angles along the curve. This project could later be extended to provide smooth camera motion in other environments and applications.

Figure 3: *Chambered Nautilus, one commonly cited example of naturally occurring logarithmic spiral*

- GUI: Dynamic user input for affecting curve output attributes (curve height, radius, etc.)
- 3D graphics engine: Panda3D or PyOpenGL/PyBullet as a backup
- Web Deployment for accessibility

III. Timeline & Work Plan

- Week 1 (June 23-30): Set up 3D environment and test camera positioning
- Week 2 (July 1-7): Develop logarithmic spiral output
- Week 3 (July 8-14): Develop GUI for spiral attribute modification
- Week 4 (July 15-21): Attach and move camera along path; deploy application



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