

## FURY: Keyframe animations in FURY

### About me

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### Why me

- I knew about FURY from Google Summer of Code 2021 and tried to contribute back then by adding the option to use FXAA anti-aliasing algorithm for the window (didn't notice it has already been implemented as a method for the window).
- I was also practicing some of the mentioned shaders in the GSoC 21's project idea "**Add new shader effects**" such as fire shader and managed to implement it in GLSL using gaussian noise. The result shown in the videos: <https://youtu.be/tj1aysPqJpY>  
<https://youtu.be/CQY9c3oGJ3E>

Unfortunately, that summer I had a mandatory internal training, that's why I couldn't be able to participate.

- I studied both linear and non-linear interpolation methods in two numerical analysis courses.
- I'm skilled in writing GLSL and Godot Shaders.
- Last year as a course project I developed a 3D game in which I used Interpolation (bilinear interpolation) to interpolate the terrain's height (y) at any given (x-z) coordinates, so that entities can move on 64\*64 pixels heightmap based terrain smoothly. I also implemented for this game an animation system that used obj sequence animations from scratch (I didn't use other matrix-based animation since it was required that we use an old version of OpenGL in which shaders were not available yet).

The source code of the game: <https://github.com/m-agour/MummyIsland>

- I've been using Keyframes and animations for more than 8 years in Adobe After Effects CS6. I'm also familiar with various Keyframe animation systems in different computer graphics softwares such as 3DS Max, Cinema 4D, Maya 3D, Blender, and Godot. Hence, I know exactly what functionalities to implement in the keyframe animation system.

## Code contribution

1. <https://github.com/fury-gl/fury/pull/552>
2. <https://github.com/fury-gl/fury/pull/555>

## Project information

**Sub-org name:** FURY

**Project Abstract:** Implementing Keyframe animations in FURY.

### Detailed description:

Implement a Keyframe animation system for FURY with public API that has the following functionalities:

Play, pause, rewind, and reverse play the timeline.

Add or remove keyframes at any specific time.

Interpolate position, scale, rotation (using SLERP) and opacity for the animated actors or camera using linear and non-linear methods.

Visualize the motion path of the translation.

## **Weekly timeline:**

- **Week 1:**

A basic timeline of events and keyframes will be implemented with linear interpolation on translation and scale.

Implement the play and pause functionalities. The ability to rewind the to a specific keyframe or event. As well as replaying the timeline.

- **Week 2:**

Allow the timeline to reverse play starting from the end, an event or a keyframes.

Add the ability to add and remove actors from the scene according to the keyframe.

- **Week 3:**

Allow handling opacity as a keyframe.

Implement fade-in/fade-out animation for actors with controllable duration using linear interpolation.

- **Week 4:**

Implement non-linear interpolations starting with spline, Bezier, and quadratic interpolations.

- **Week 5:**

Document, test, and make tutorials for what I implemented in weeks 1, 2, 3, and 4.

- **Week 6:**

Implement easing (ease-in/ease-out) for the animation system.

Implement SLERP (quaternion interpolation) for rotation keyframes.

- **Week 7:**

Add the ability to interpolate camera by the keyframe system using the previously implemented interpolating techniques.

- **Week 8:**

Tune the implementation for speed using the vertex shader in GLSL.

- **Weeks 9 and 10:**

Add the ability to create and visualize motion paths in the animation system for each actor with the ability to change its color, opacity, step (resolution), or thickness to differentiate between each motion path.

Allow the motion path to focus on the current state in the timeline so its opacity would be 100% where the actor is currently at and decreases as the actor moves away from that state as shown below.



- **Weeks 11 and 12:**

Document, test, and make tutorials for what has been implemented in weeks 6, 7, 8, 9, and 10.

Implement any postponed tasks.

- **Final week:**

Submit the project and report all my work.

## **Other commitments**

- I don't have any commitments for this summer.
- I'm not applying to any other organization.