Object Rewind System - Documentation

Overview

The Object Rewind System is a lightweight and flexible Unity component that enables per-object time reversal. It works seamlessly in both 2D and 3D environments, allowing developers to reverse the movement and rotation of individual objects or groups. This can be extremely useful for puzzles, cinematic effects, or gameplay mechanics involving time manipulation.

Setup Instructions

1. Add a Rigidbody (for 3D) or Rigidbody2D (for 2D) component to your object.
2. Attach the `object_rewind` script to the same object.
3. Make sure the Rigidbody has gravity and other physics interactions enabled.
4. To trigger rewind, simply call `Rewind()` on the script instance.
5. To stop rewind, call `StopRewind()`.

Example:

```
rewindComponent.Rewind();  // Start rewinding
rewindComponent.StopRewind();  // Stop rewinding
```

How It Works

The system continuously records the object's position and rotation over time into a circular buffer. When rewind is triggered, the object's physics is disabled (set to kinematic) and it begins stepping backwards through the recorded positions and rotations, using smooth interpolation (slerp/lerp) to replay the motion in reverse. Once rewind finishes, the object's physics is restored.

Customization Options

- timeDurationInSeconds: Total number of seconds to store in memory.
- recordInterval: Number of fixed updates between each recorded frame (controls granularity).
- playbackSmoothness: Interpolation value for smoothing rewind playback.

Troubleshooting

- Object is not rewinding:
  - Make sure the object has a Rigidbody or Rigidbody2D attached.
  - Confirm that the `Rewind()` method is being called.

- Rewind stops too soon:
  • Check if the object has enough buffer size for your time window.
  • Increase `timeDurationInSeconds` or decrease `recordInterval`.

- Object jumps or jitters during rewind:
  • Adjust `playbackSmoothness` for smoother interpolation.
  • Ensure recorded transforms are not being altered by external forces during rewind.

Final Notes

The Object Rewind System provides developers with a modular and customizable way to introduce time-reversal mechanics into their Unity projects. Whether you're creating puzzles, undo features, or visual effects, this system offers precise control without complex setup.