Oregon State University

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# VR Pump Bearing Replacement Training

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COLLEGE OF ENGINEERING

School of Electrical Engineering and Computer Science

# Pump Assembly in Workshop Context



# Topic Selection: Bearing replacement In Pump

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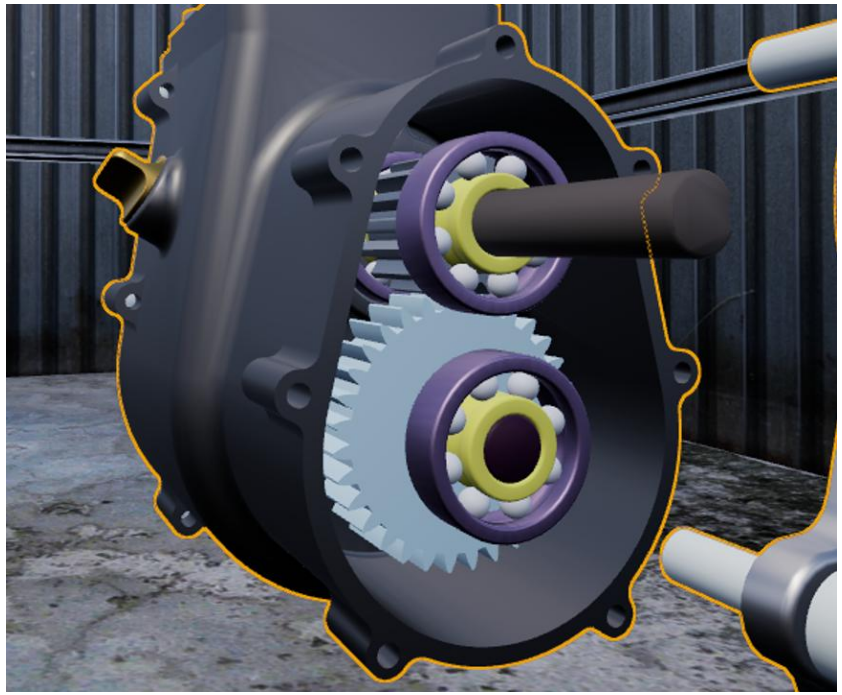
- Bearings serve as a critical interaction point between rotating and non-rotating components (between shaft and pump housing)



# Research

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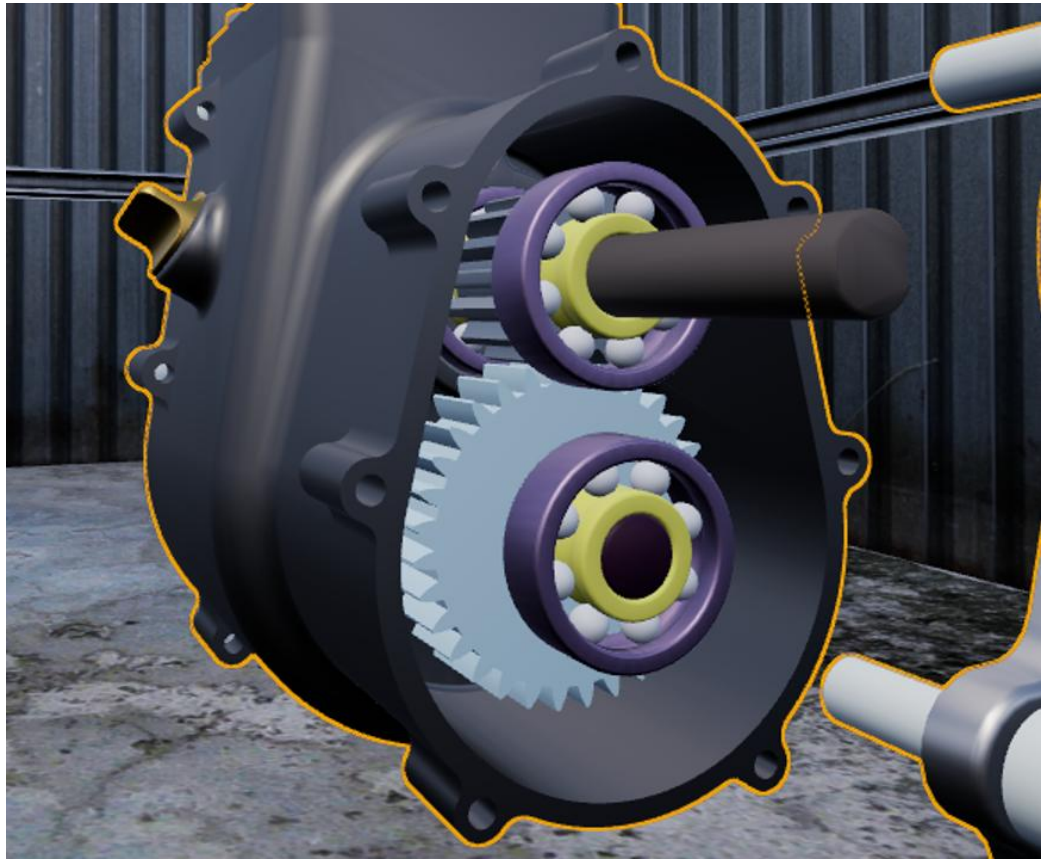
- Bearing Replacement Guide: Learn how to inspect bearings that need to be replaced
- Maintenance Tutorials: Learn the disassembly sequence
- Shaft Interconnected Structure: Learn about the function of the driving shaft, driven shaft with gears interaction.



# Development Key Point

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- Event Handling: As users advance through the step-by-step assembly guide, they interact with the environment to complete actions. Thus, Completion events need to be dispatched among different components and UI.
- Feedback Mechanism: Incorporate dynamic visual feedback (highlighter, blinking material) to indicate related components and audio feedback (correct, wrong, warning, rotation sound) to indicate action's completion and pump's status.
- Interaction Techniques: Implement intuitive grabbing and snapping interaction for users to interact with objects

# Interaction Techniques: Grabbing



- Users can grab objects when they move the VR controllers to overlap with an object and press the trigger button in the overlapping VR controller.
- As the controllers overlap with an object, an object is highlighted with boundaries to indicate that object is overlapped and ready to be grabbed.
- As users press the trigger button, objects are attached to the VR controller

# Grabbing – Technical Implementation

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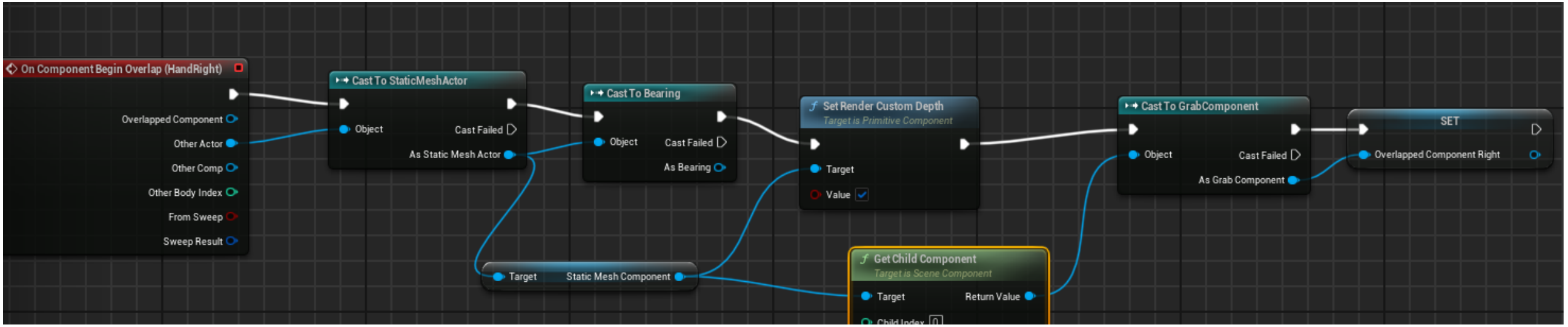


# Interaction Techniques – Grabbing with constraint

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- Advanced Scenarios: Users want to grab a bearing while it is attached to the shaft
- Solution: While the bearing is still on the shaft, users can only move the bearing along the shaft (in one axis) until the bearing is out of the shaft, then users can grab the bearing as usual.

# Grabbing with constraint - Implementation

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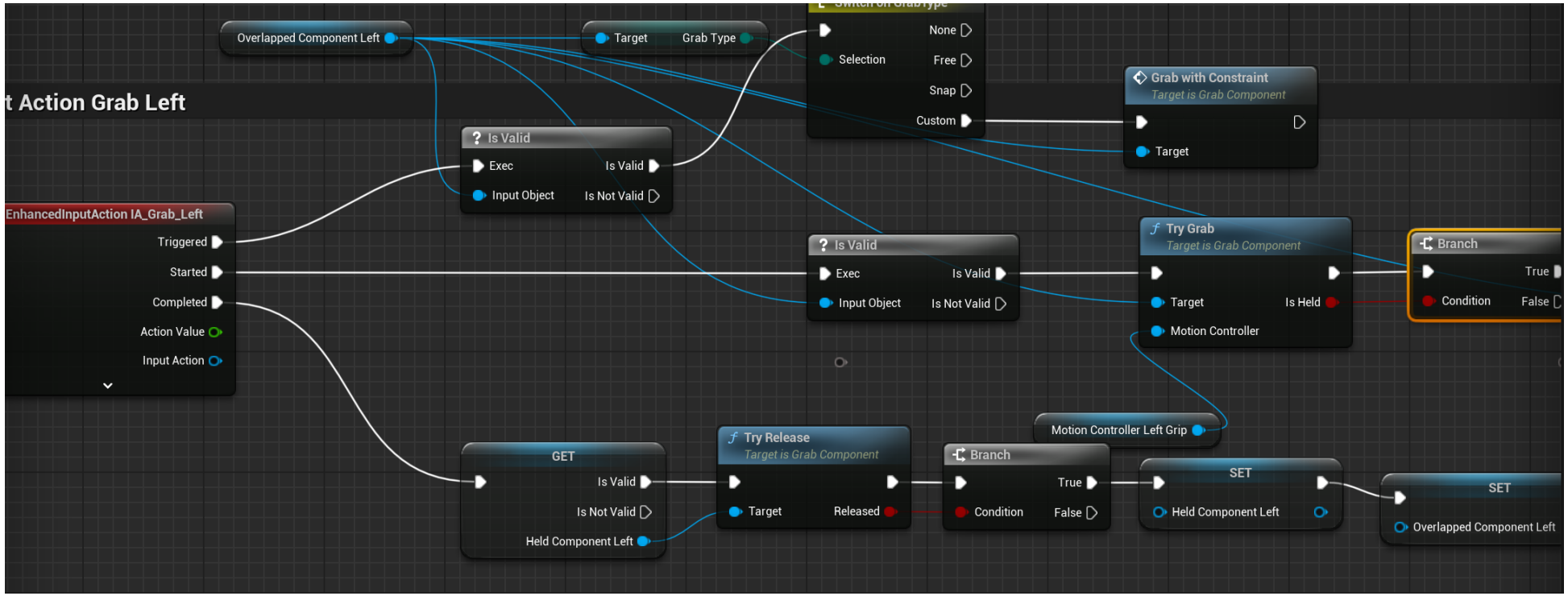
- Implement 'custom' grab type for bearing initially



# Grabbing with constraint - Implementation

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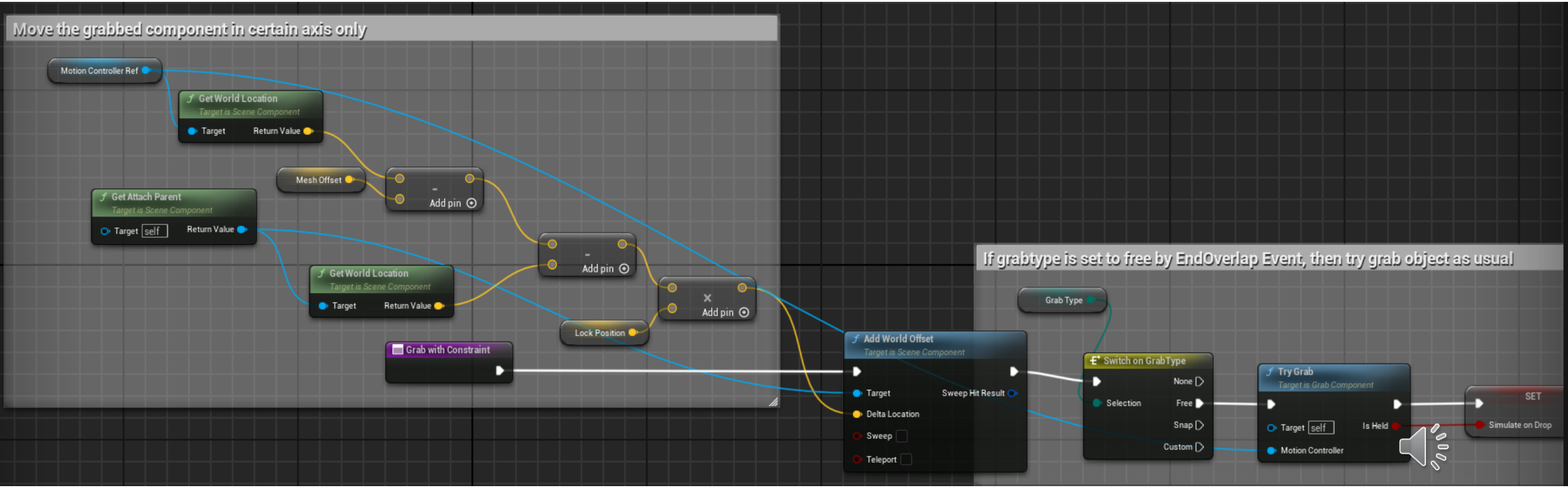
- Lock Position Vector (1,0,0) -> move only in X direction



# Grabbing with constraint - Implementation

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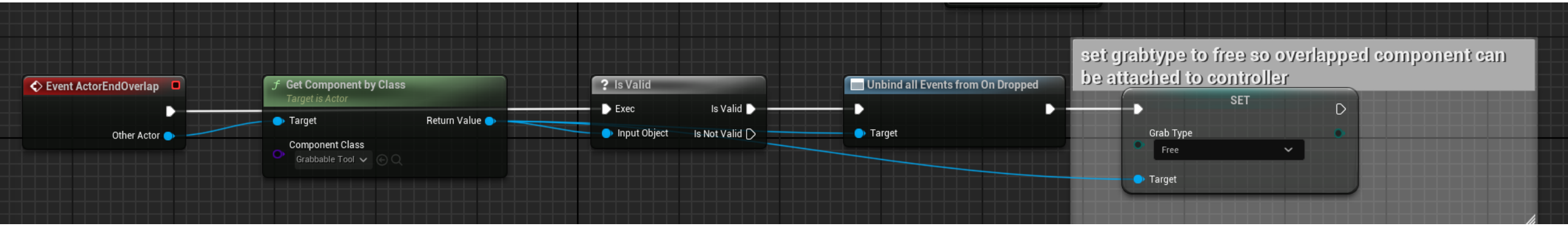
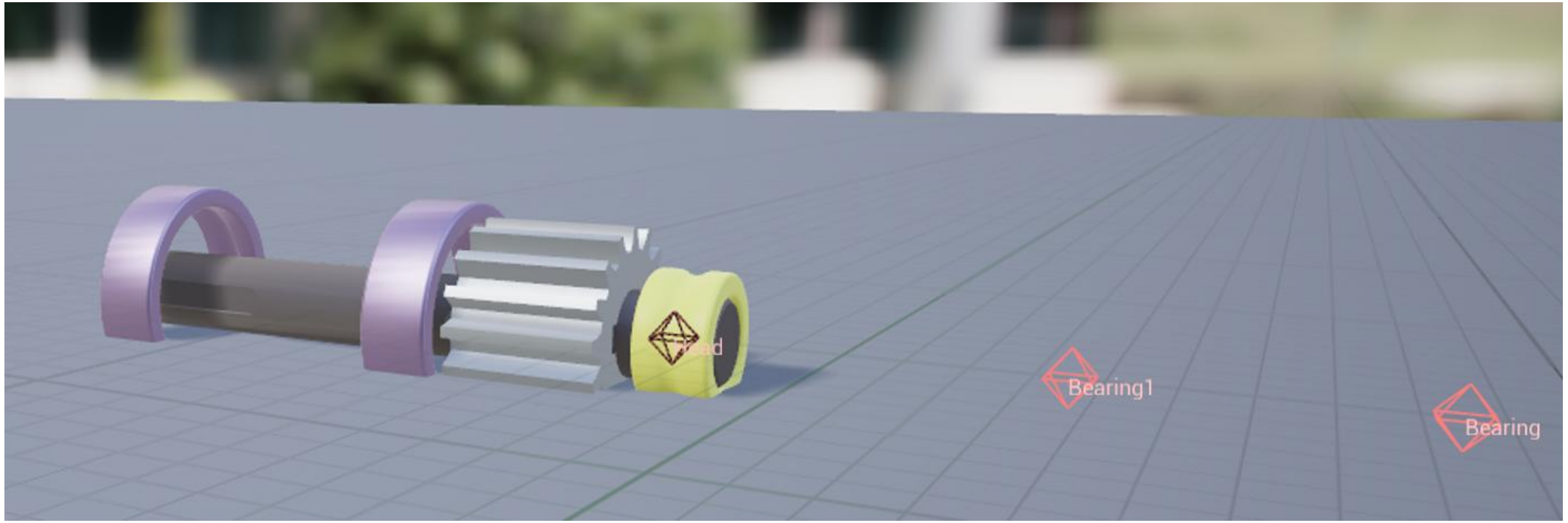
- Shaft: End Overlap Event set the overlapped component to free



# Interaction Techniques: Snapping



- Use case: Bearing can be placed onto the shaft by snapping
- As users bring the bearing close to the shaft, it is automatically snapped to the head of the shaft



# Snapping – Implementation

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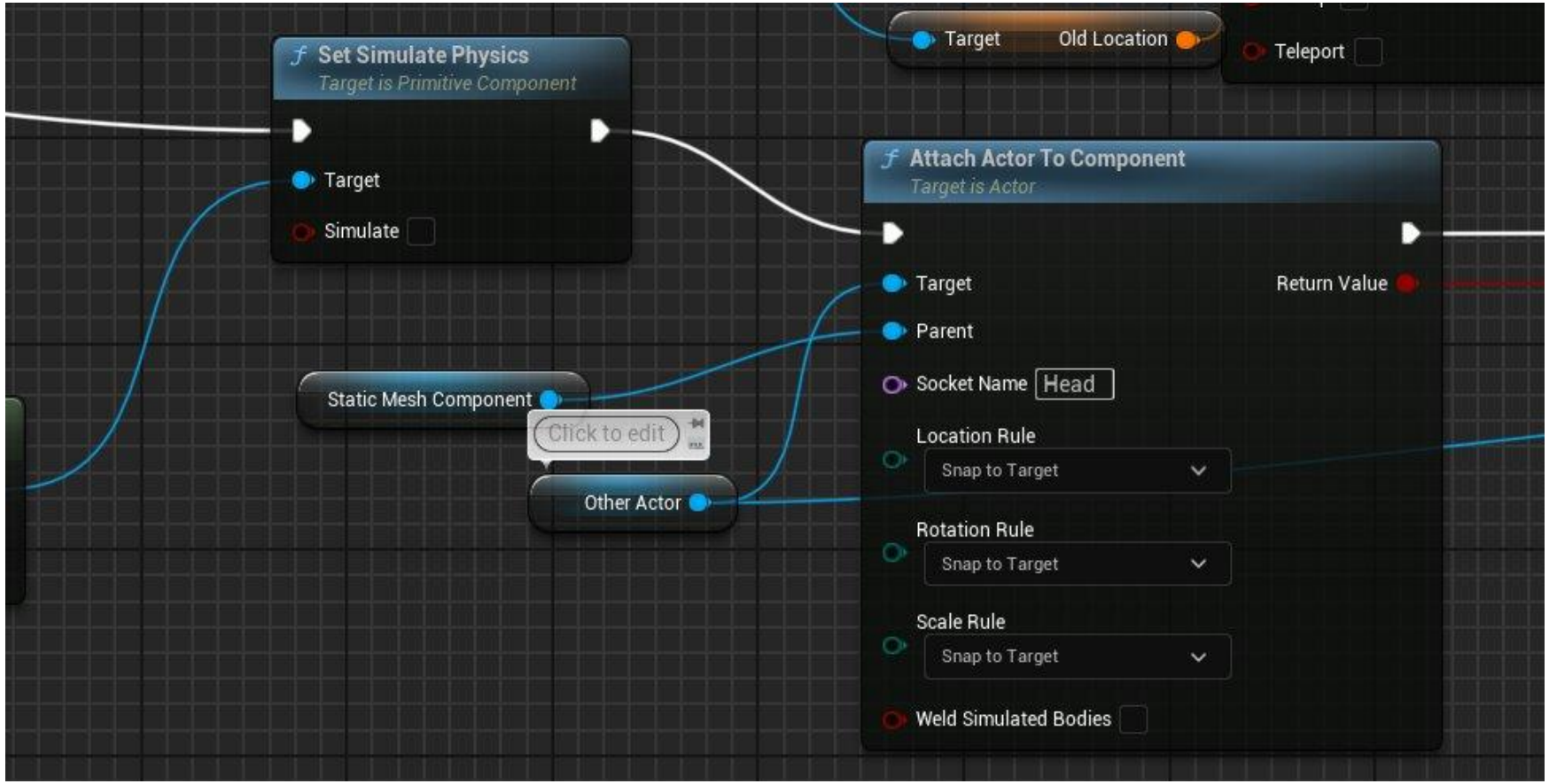
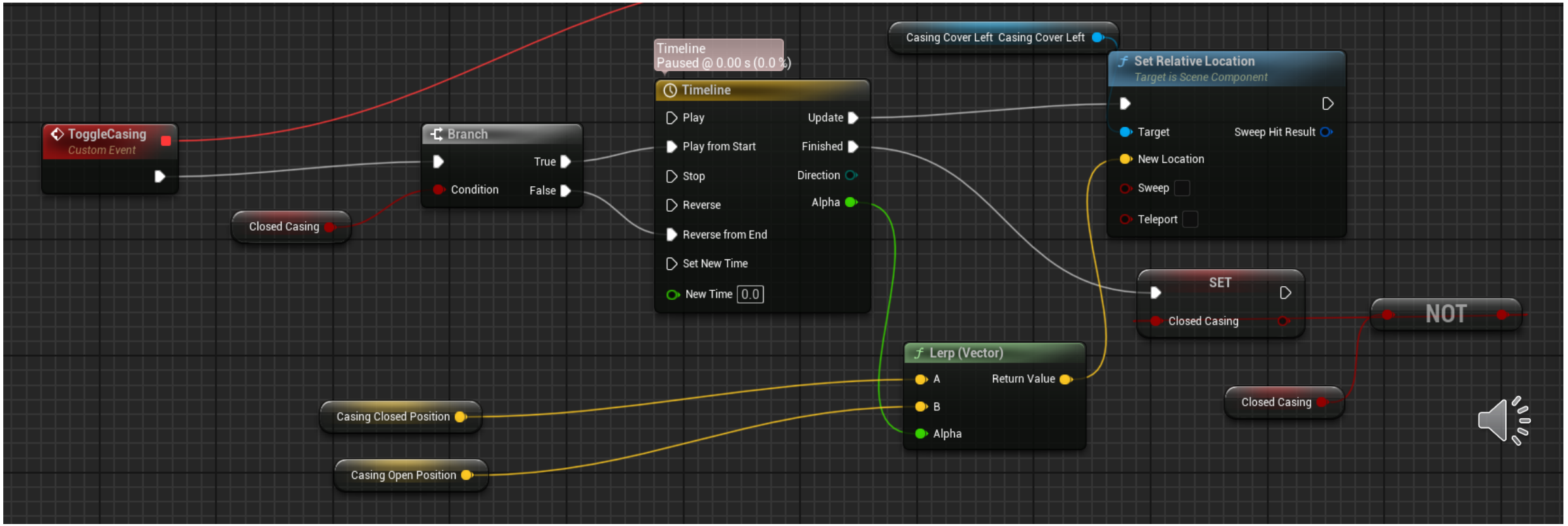
- Socket Manager: Head, Bearing1, Bearing



# Animation Techniques – Timeline Node



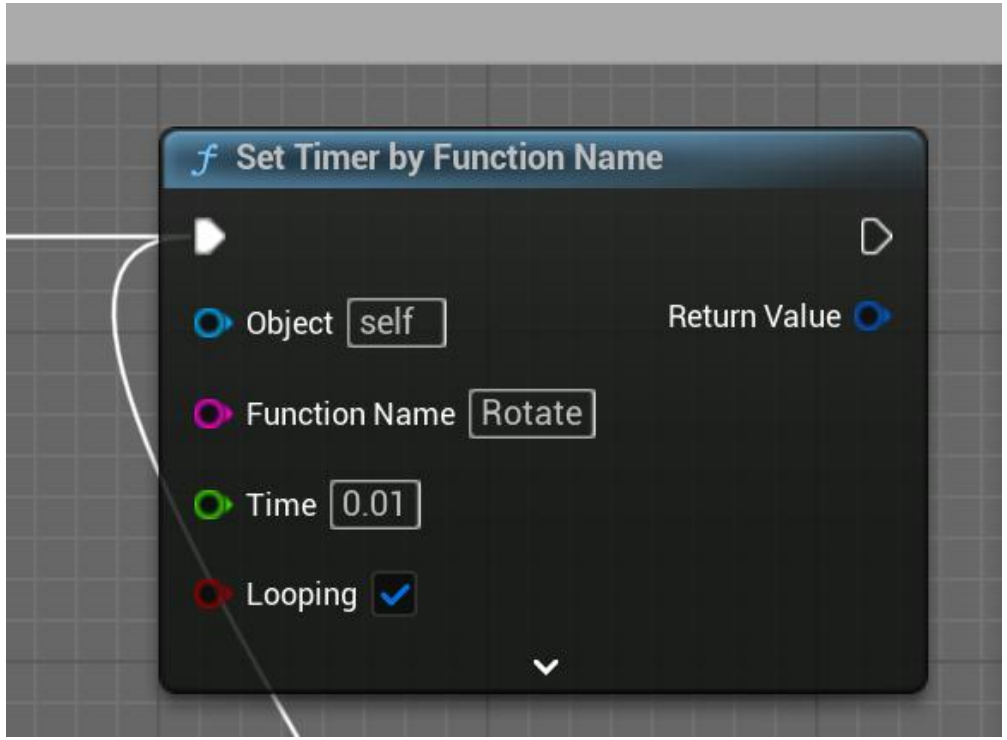
- Use case: Animation of opening and closing casing
- Solution: Use Timeline node to interpolate between casing's open position and close position

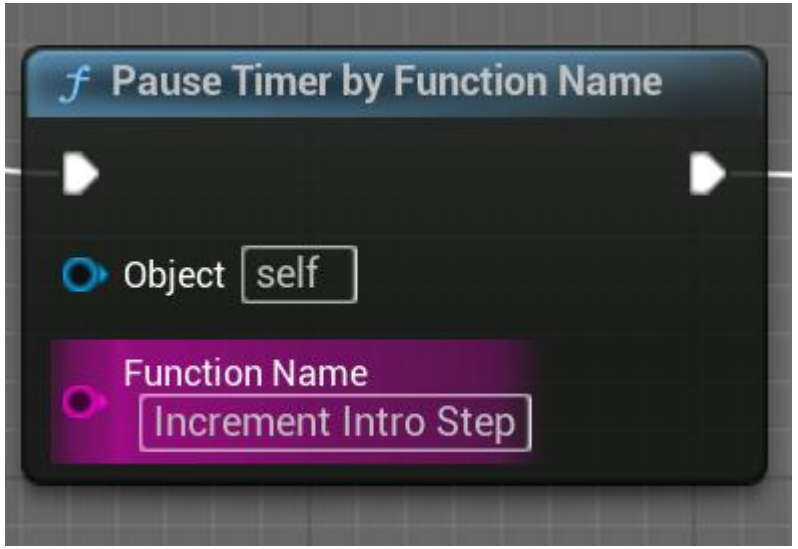


# Time-based animation: Set looping timer by function name



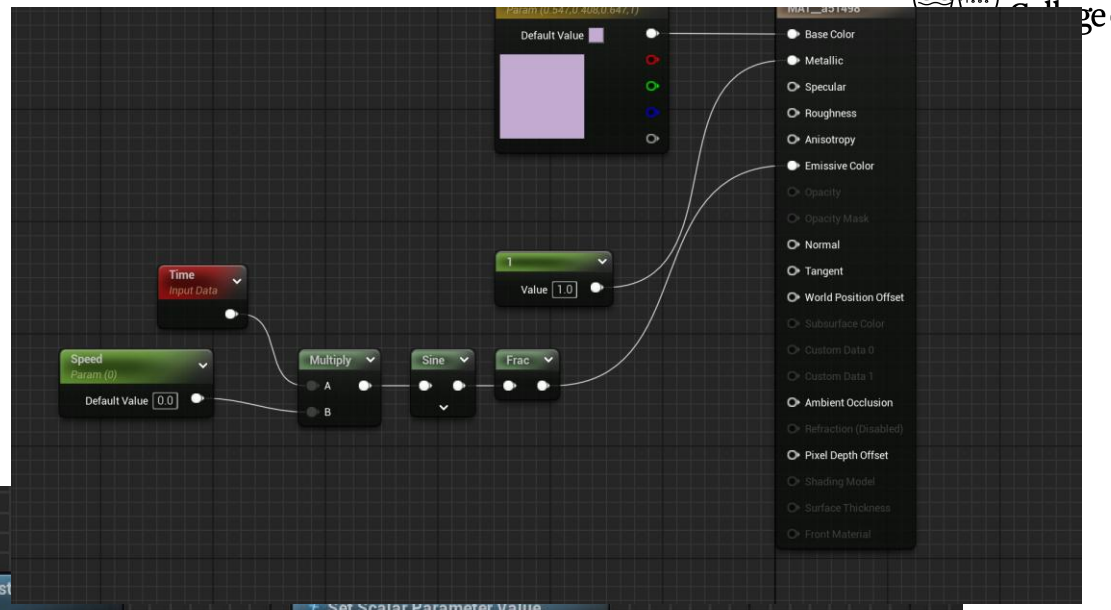
- Use case: Rotation of gear system, time-based transition of UI

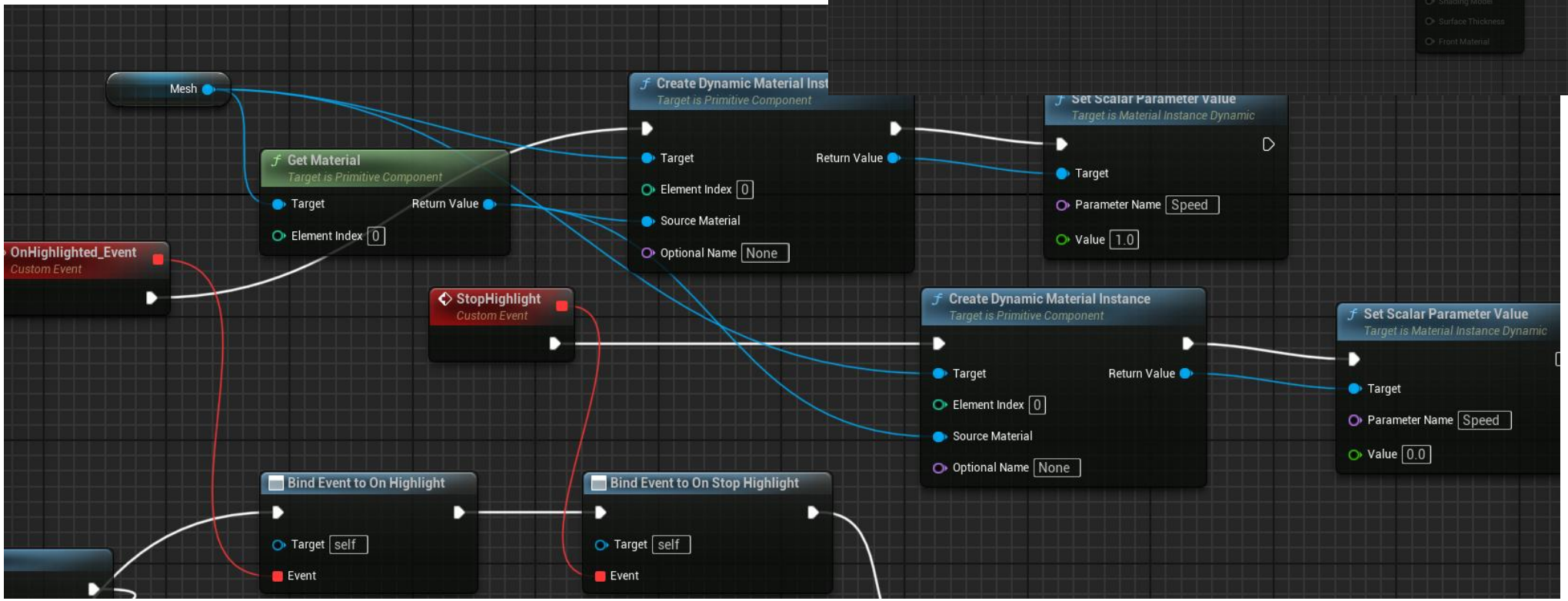


# Visual Feedback

- Blinking Material



# Demo




Remote Desktop
See More in Library
Cast
Take Photo
Recording
Go Live
Settings
Recents

# Personal Growth

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- Organization: Learn how to organize attributes, events, and variables in different components in a way that make sense.
- UI design: Learn how to design and organize UI with a widget switcher, interaction in an intuitive way
- Immersion: Learn to create an immersive and realistic experience with combined sound effects, 3D assets, and materials


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# The End