Project A: Waving Arm and Rotating Boxes

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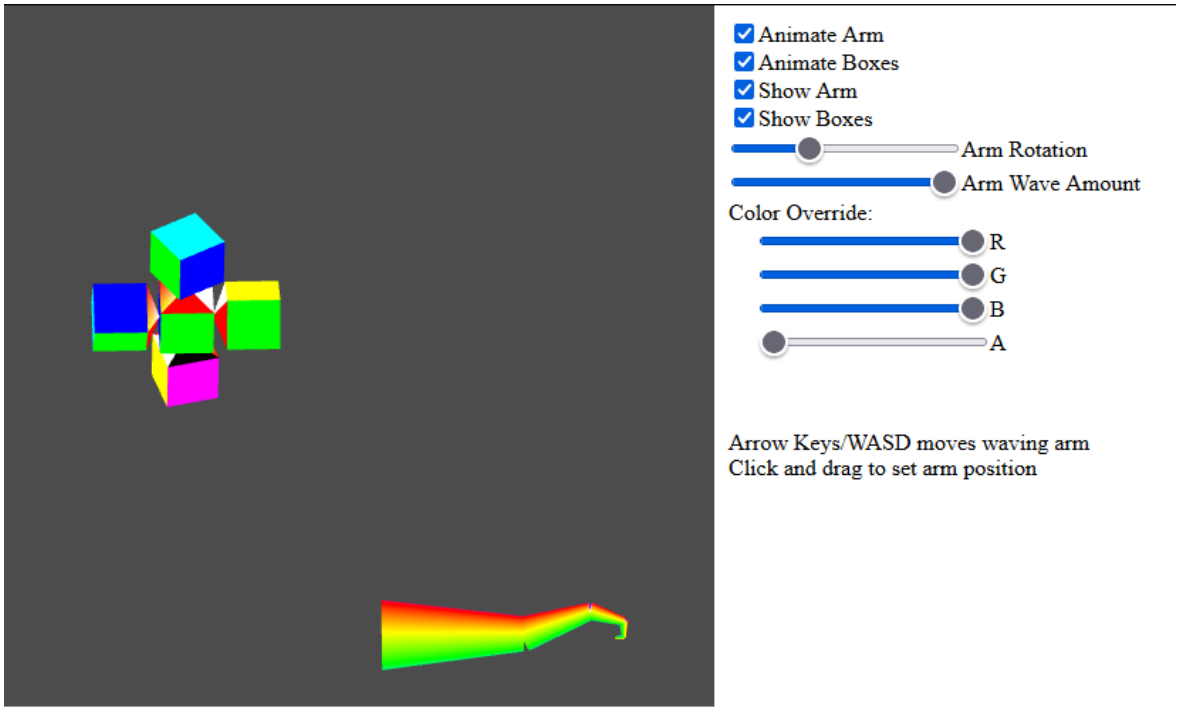
Goals

- Create interesting movements using simple shapes
- Create movements that look fluid, as if it were a single object bending rather than multiple objects rotating around points in space
- Use blending to demonstrate the ability to mix colors in the shader program

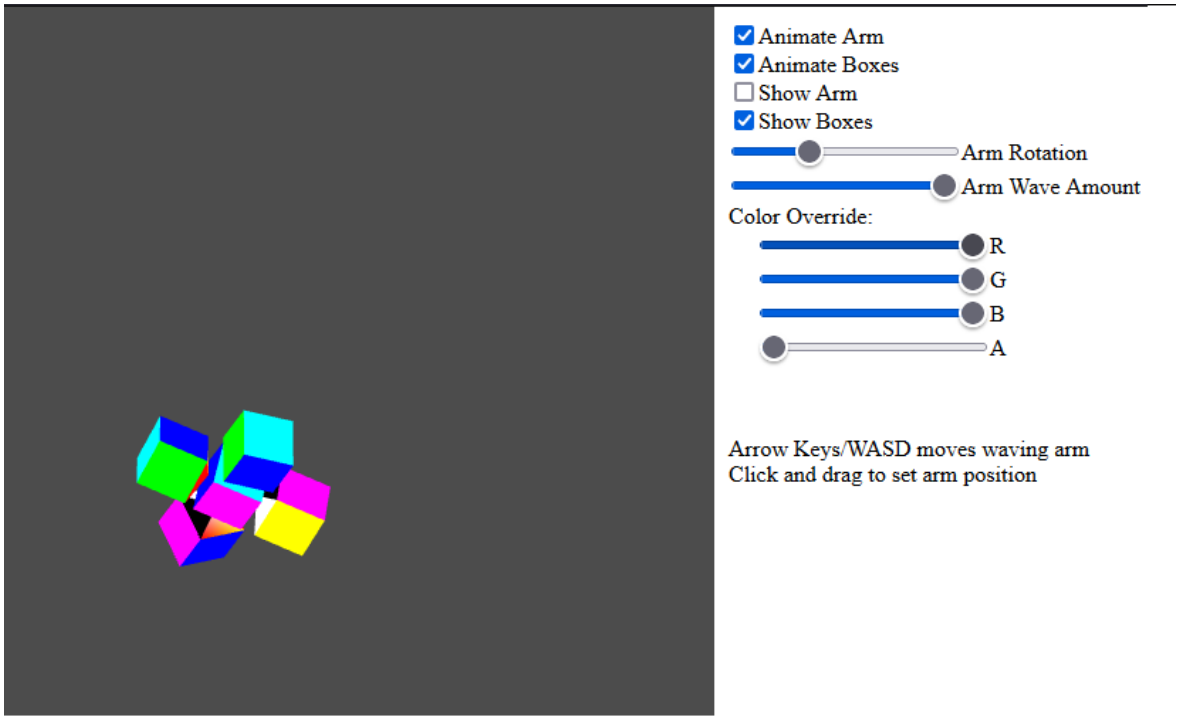
Controls

- Pressing arrow keys or WASD moves the waving arm around the screen.
- Clicking sets the position of the waving arm.
- Clicking and dragging moves the waving arm around the screen.
- “Animate” checkboxes enable/disable waving/rotating animations.
- “Show” checkboxes show/hide objects on screen (note that animations will still happen in the background so when an object reappears it may not be where it was when it was hidden).
- “Arm Rotation” slider rotates the arm around the X axis so you can see all the parts of it.
- “Arm Wave Amount” slider changes how wavy the arm is.
- “Color Override” sliders allow the user to override all vertex colors with a custom RGBA value. The selected alpha value will be used for blending with the original color.

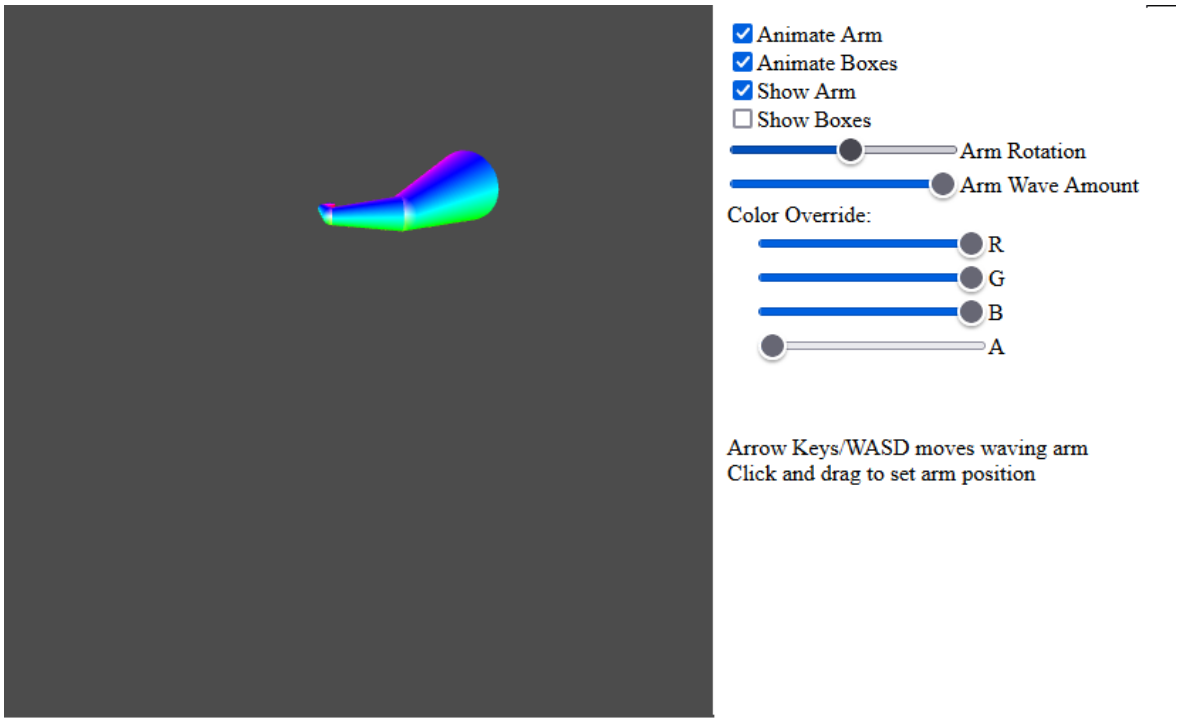
Results



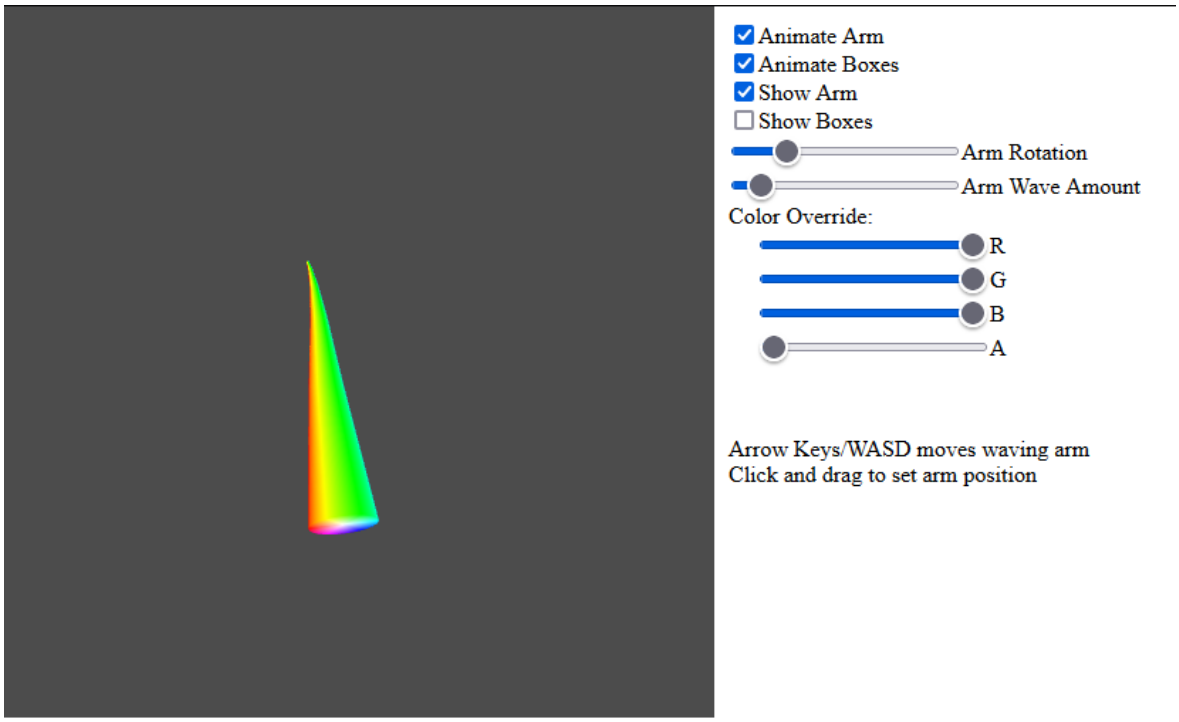
[Both assemblies as they appear when the page first loads]



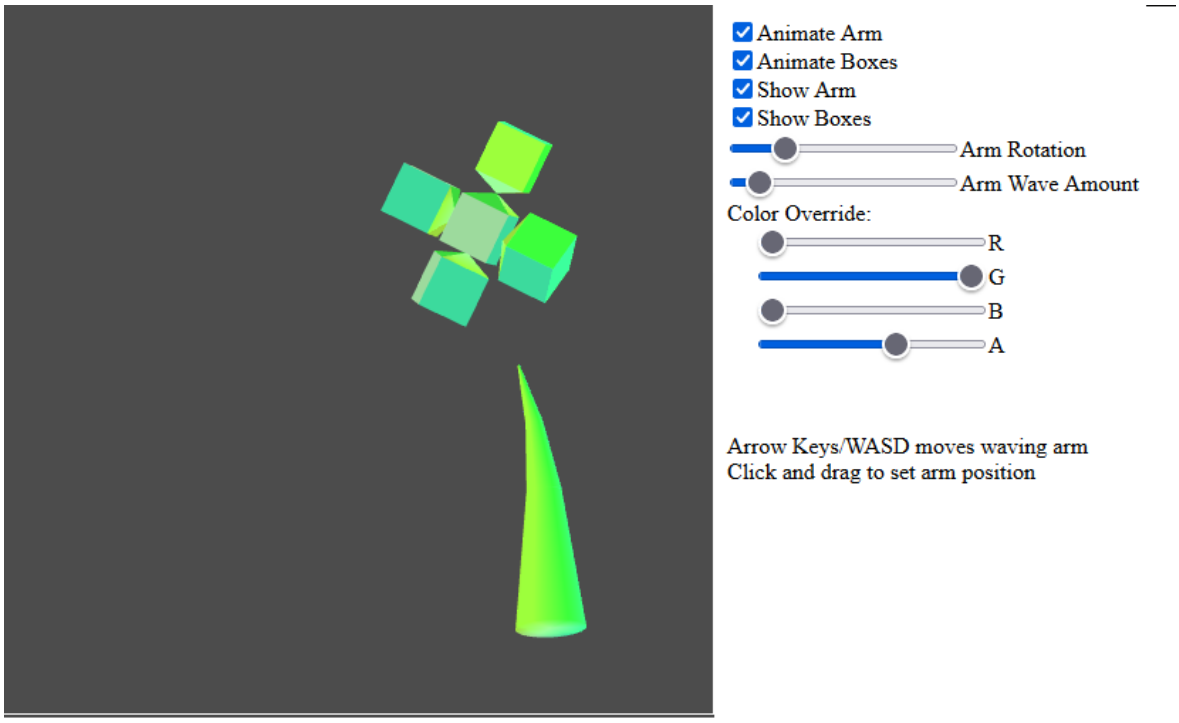
[The boxes rotate around many axes and move around the screen]



[The arm can be moved and rotated about the x axis]

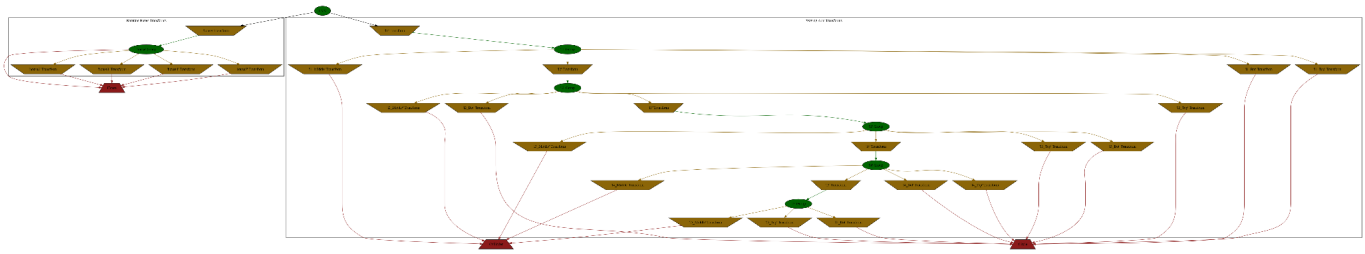


[Smaller “Arm Wave Amount” values lead to more subtle movements]



[Color Override can be used to apply a tint to all vertices]

Scene Graph



The scene graph is a bit large, as seen above. A bigger version exists at https://bit.ly/3bcTDEu. The graph creator I was using does not support the T shape for transforms, so I replaced it with a trapezoid with the shorter side on the bottom, which almost resembles the T shape. The squished cylinder object (for each of the sections of the waving arm) is split into multiple meshes - the circles at the top and bottom, and the curved rectangle around the middle (which is named “Cylinder” in the graph). This makes generating points easier. A single function generates transforms for the Top, Bottom, and Middle portions, so they will never be misaligned, and so they can be treated as a single part.

This graph was created based on the object hierarchy, which is shown below: