Project B: Flight Around a City

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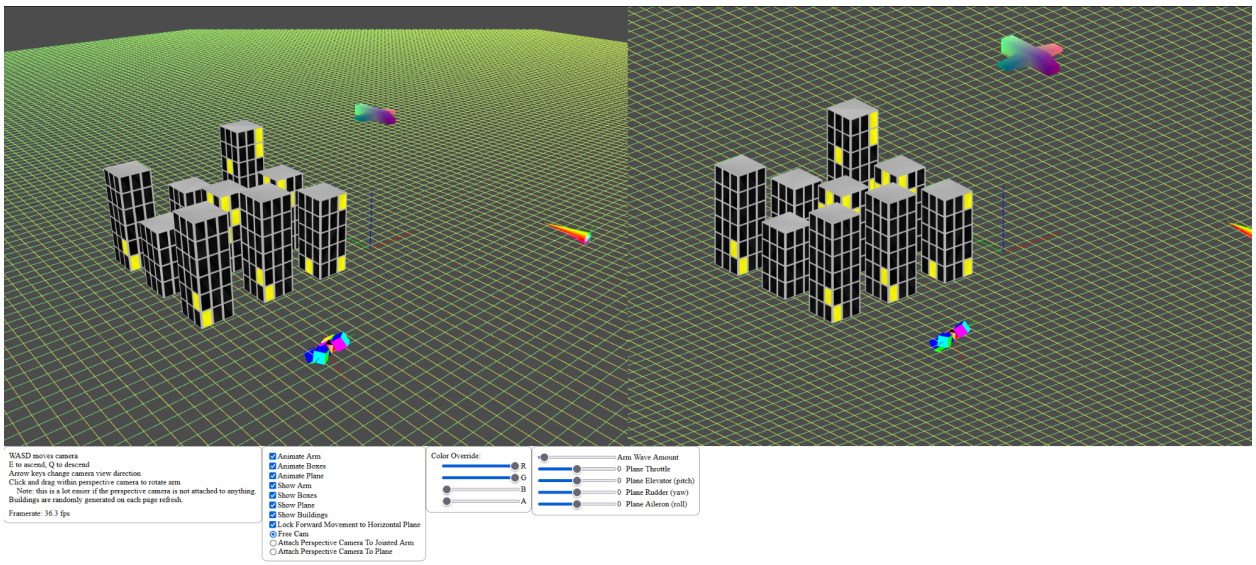
Goals

- Augment project A with additional objects
- Create a plane object with plane controls that the camera can attach to
- Attach camera to waving arm object
- Create randomly generated buildings which are different every time the program is run

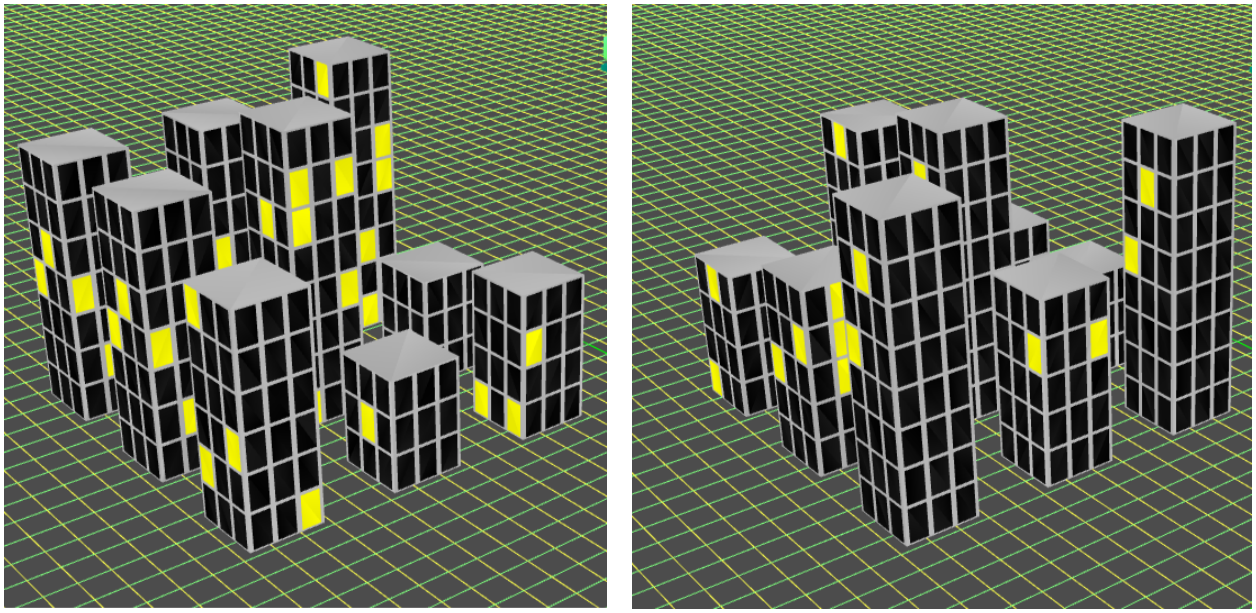
Controls

- WASD moves the camera
    - By default, this movement is locked vertically i.e. the Z position will not change
    - This behavior can be changed by unchecking “Lock Forward Movement to Horizontal Plane”
- Arrow keys change the view direction
- Clicking and dragging in the perspective camera rotates the waving arm.
- “Animate” checkboxes enable/disable 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 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.
- “Plane Throttle” controls how fast forward or backward the plane moves
- “Plane Elevator” controls the rate of change of the pitch of the plane
- “Plane Rudder” controls the rate of change of the yaw of the plane
- “Plane Aileron” controls the rate of change of the roll of the plane
- “Free Cam” allows the user to control the movement of the camera directly
- “Attach Perspective Camera to Jointed Arm” attaches the camera to the jointed arm such that it is viewing in the +X direction of the tip of the arm
- “Attach Perspective Camera to Plane” attaches the camera to the plane as if you were flying it

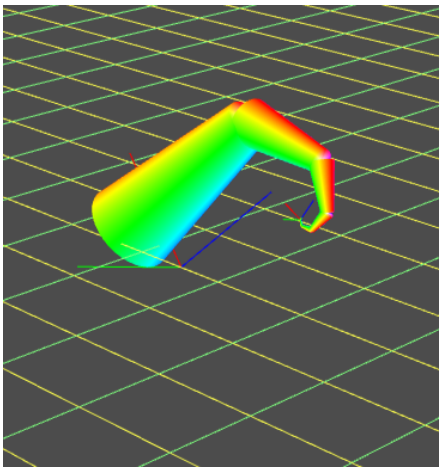
Results



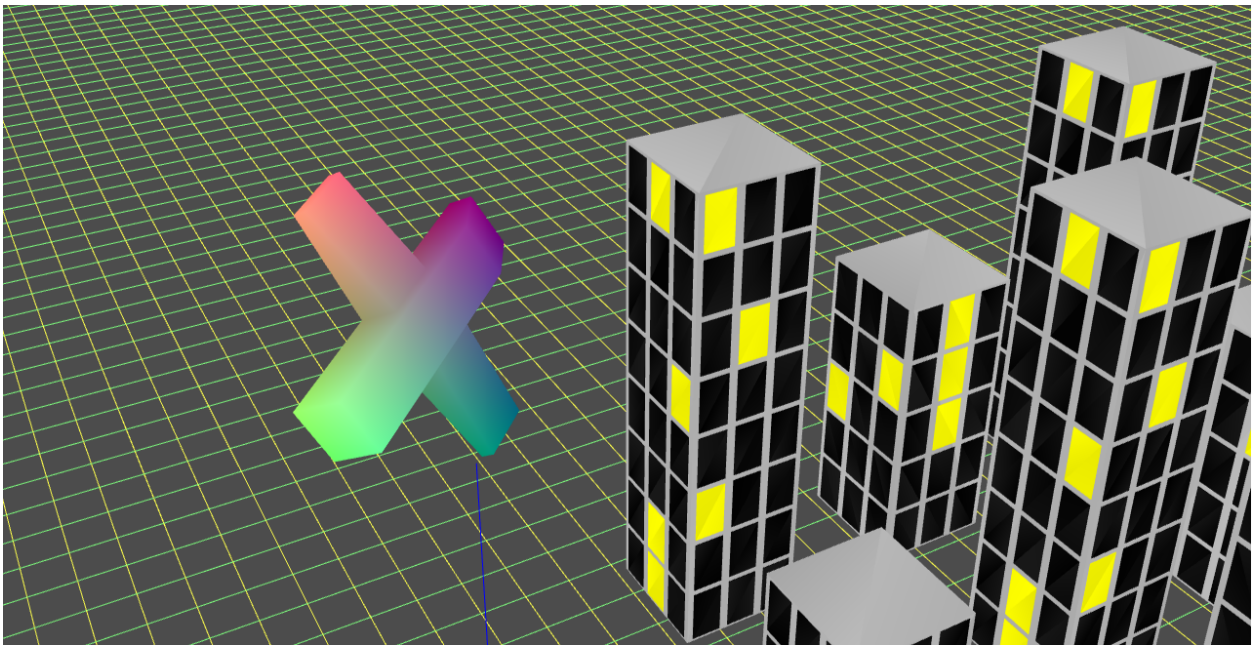
[Both perspective and orthographic cameras are displayed]



[Buildings are regenerated on each reload]



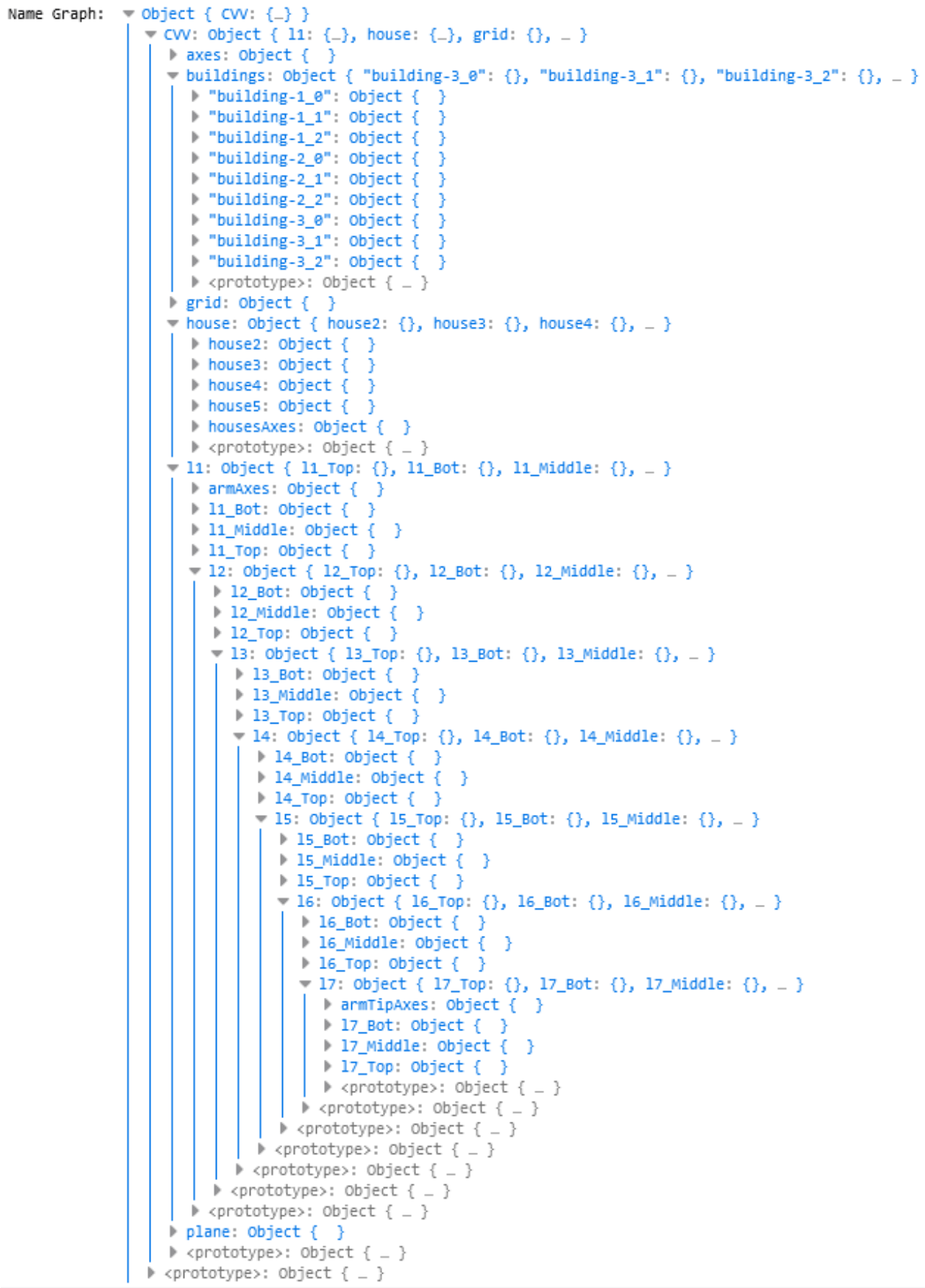
[Jointed arm can be rotated to any orientation]



[Plane can fly around the city]

Scene Graph

The scene graph is a bit large, as seen above. A bigger version exists at https://bit.ly/3Hm6ZNO. 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 generated automatically based on the object hierarchy, which is shown below:


Name Graph:
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CVV: Object { l1: {…}, house: {…}, grid: {}, … }
axes: Object { }
buildings: Object { "building-3_0": {}, "building-3_1": {}, "building-3_2": {}, … }
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grid: Object { }
house: Object { house2: {}, house3: {}, house4: {}, … }
house2: Object { }
house3: Object { }
house4: Object { }
house5: Object { }
housesAxes: Object { }
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armAxes: Object { }
l1_Bot: Object { }
l1_Middle: Object { }
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