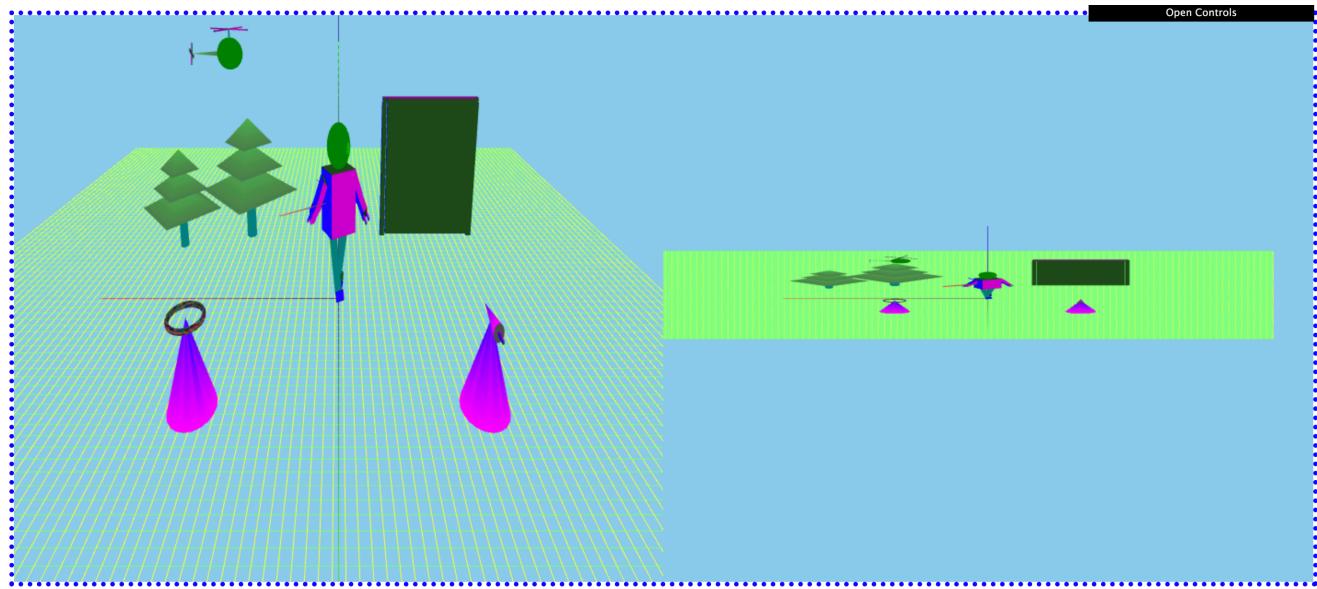


Robot and Helicopter in a scene

Report for Project B on Computer Graphics.

Haoyu Wei - HWJ9151



Keyboard/Mouse Instructions:

Drag your mouse to rotate the robot.
Press 'WSAD' keys to walk close to the cones.
And press Space to pick up things or open/close the Door!
Press 'P' to pause/start robot moving.
Try to CLICK on the Helicopter area to stop/start it!

Press 'H' to hide/show the control bar.
Press 'IJKL' to move the camera's direction horizontally/vertically.
Press $\leftarrow\uparrow\downarrow\rightarrow$ to move the camera sideways/up/down.
Press '+/-' to move the camera forward/backward.

Figure 1. A screenshot of the user interface.

Introduction

In project B, I built a 3D interactive scene that allows a robot to walk around, pick up things and open/ close doors, with a helicopter flying around on top. The robot is by default dancing at the center without holding anything. But once you pick up a thing, you'll get a jointed 4 segment shape (arm).

On the left side of the webpage is the perspective/frustum viewport, and on the right side is ortho view from the same lookAt direction and with required ratio of ortho

parameters ($z=(\text{far}-\text{near})/3$). We can also travel around the scene using simple key events. While moving and turning the camera, the robot can be rotated through mouse drag properly no matter which direction it's walking towards.

There is also a control menu that can be hidden on the upper right corner of the canvas that contains numerous functions. And you can resize the window without having scroll bars. The world coordinate and robot coordinate axis are displayed with X,Y,Z == R,G,B.

User Guide

This user guide consists of three parts: Control the robot, helicopter and adjust viewport. Figure 2 and 3 illustrates the results.

- ❖ Press 'H' or 'Close Controls' to hide the control menu.

Control the robot:

- ❖ Drag the robot to see quaternion rotations.
- ❖ **Walk:** Press 'W''A''S''D' keys on your keyboard to control the robot walk forward / backward / left / right. Or click 'walk' button in the robot folder in control menu to make it walk continuously. Once it starts walking, slide the 'walkSpeed' slider to change its walking speed.
- ❖ **Bow:** Click the 'bow' button in the robot folder in control menu to make it bow.
- ❖ **Pick up things / Open** the door: Walk the robot to the cones in the front or the door behind, press 'space' to pick up a spinning torus or an umbrella or open / close the door. Or you can choose what to hold in the dropdown list 'hold' in the control menu. See [Figure 2](#), [Figure 3](#).
- ❖ **Stop/Start** the robot: Click the 'stopRobot' button in the control menu or press 'P' on your keyboard to stop / start the robot.

Control the helicopter:

- ❖ **Stop/Start** the helicopter: Click the 'stopHelicopter' button in the helicopter folder in control menu or click in the helicopter area (the top of canvas) to pause / start it flying.
- ❖ **Speed Up/Down:** Slide the 'speed' slider in the helicopter folder in control menu to change its flying speed.
- ❖ **Shape** change: Click the 'shapeChange' button in the control menu to see dramatic shape change.

Adjust viewport:

- ❖ **Turn** the camera: Press 'I'J'K'L' to turn or tilt the camera's aiming direction up/left/down/right without moving the camera. See Figure 5.
- ❖ **Move** the camera: Press $\leftarrow\uparrow\downarrow\rightarrow$ to move the camera horizontally/vertically without changing the aiming direction of camera. Press +/- to move the camera forward/backward in gaze direction. See Figure 5, Figure 6.
- ❖ **Frustum** view: Click on the frustum checkbox in the control menu to switch to frustum view on the left side. And enter numbers in the edit-boxes below the checkbox to adjust parameters of frustum view. See Figure 4.

Result

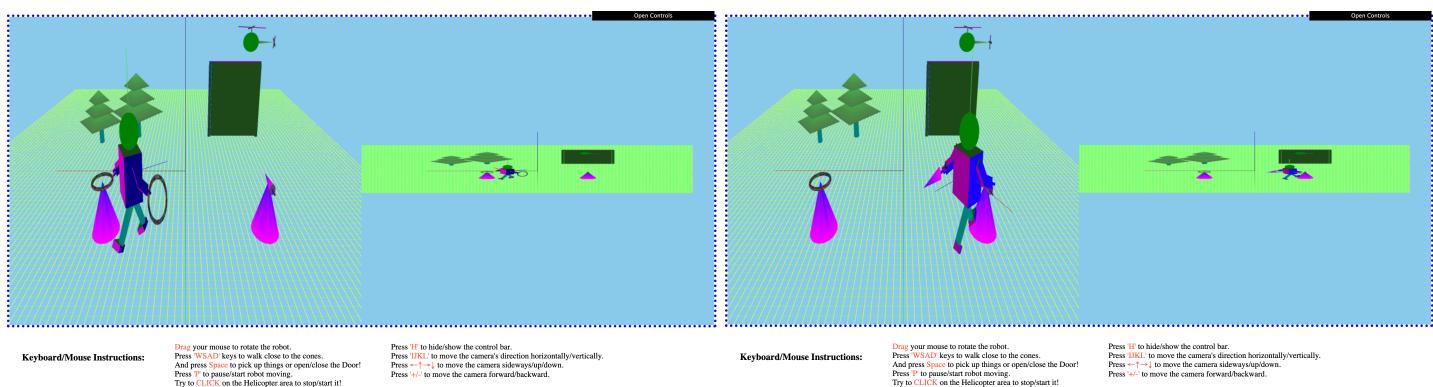


Figure 2. (Left) Robot picking up a spinning torus. (Right) Robot picking up an umbrella.

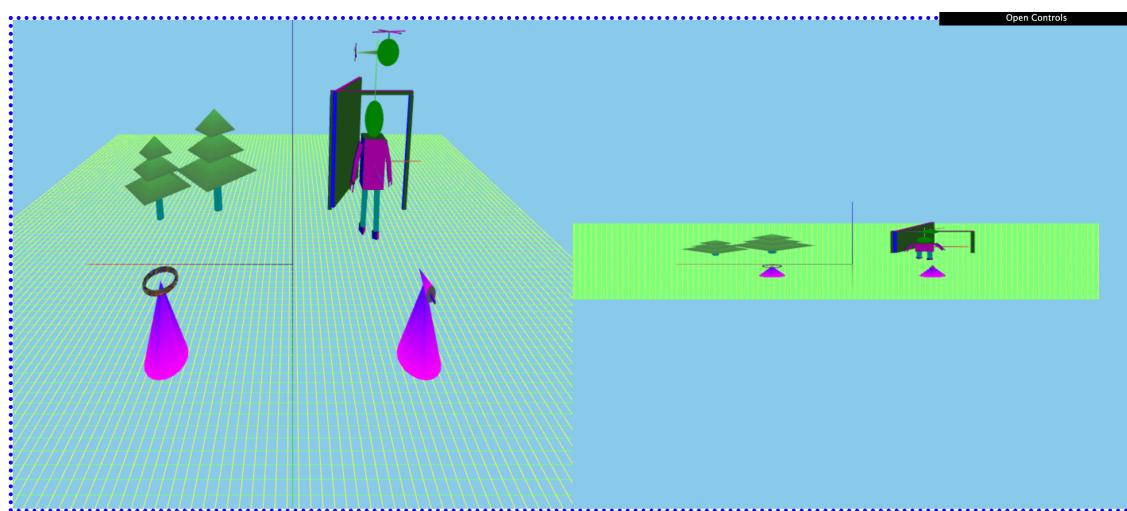
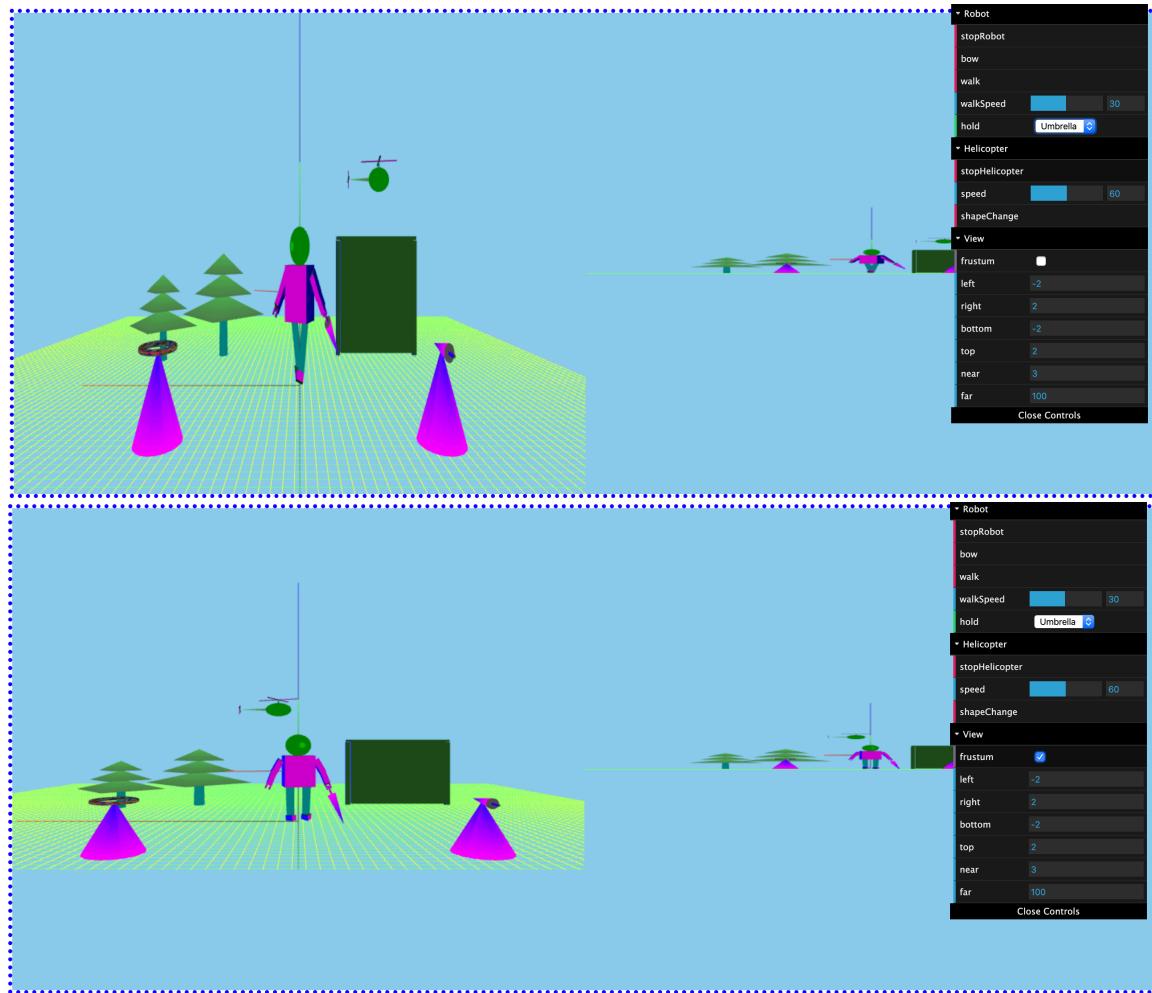


Figure 3. Robot opening the door with Space key.



*Figure 4. Frustum v.s. Perspective view. (upper) Perspective view. (down) Frustum view.
Notice the frustum checkbox has been clicked and the parameters can be set.*

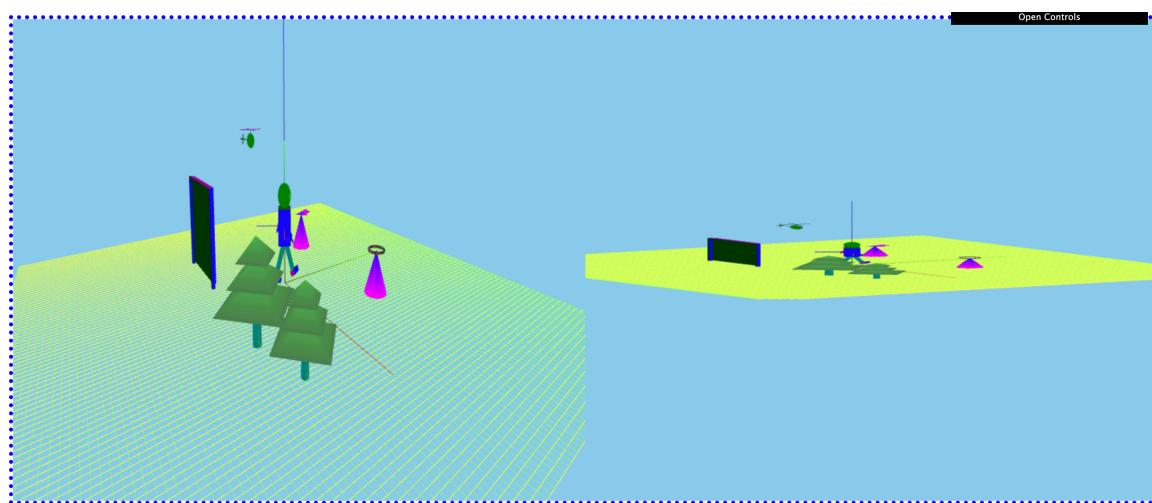


Figure 5. View from a moved and turned camera.

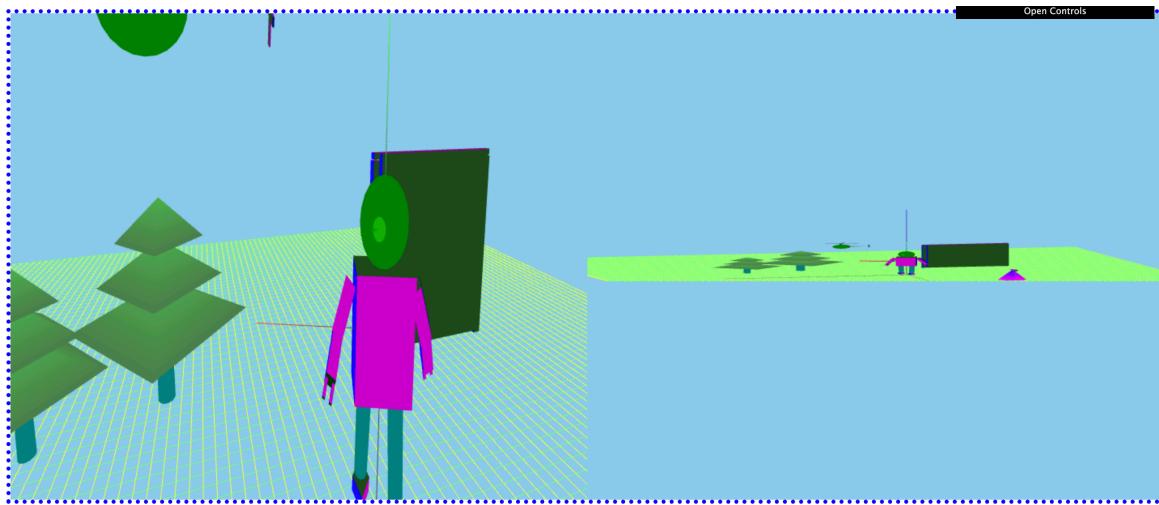


Figure 6. Use key '+' to move towards gaze direction.

Scene Graph

