

CS6323 Computer Animation and Gaming

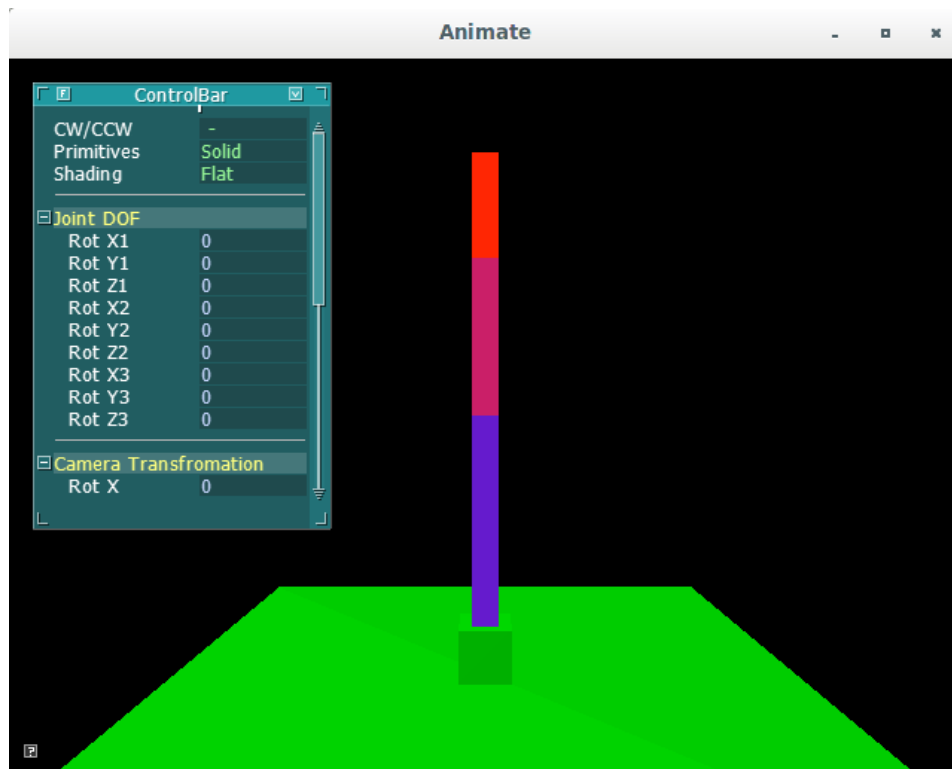
Assignment 5 (Grade: 10 Points)

Implement Forward Kinematics

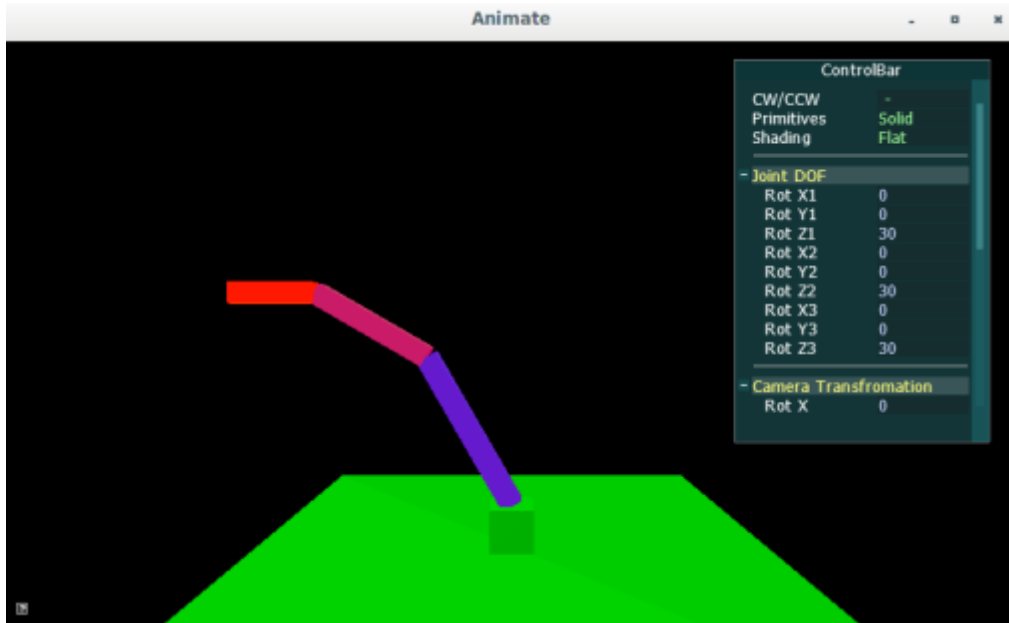
Write a program to animate a linkage with 3 joints and 9 degree of freedoms. Each bone is associated with 3 DOF, i.e. the rotation angles along y, z, x axis, respectively.

- For any 3 DOF bone, use the rotations in the following order: y-axis, z-axis, x-axis. The initial pose vector for each bone is $(\theta^y, \theta^z, \theta^x) = (0,0,0)$, with all the numbers in degrees.
- Each bone is model as a stretched cube. The four cube are of the following dimension defined in their local space, i.e. [range of x]*[range of y]*[range of z]:
 - Green: $[-0.5, 0.5] \times [0, 1] \times [-0.5, 0.5]$,
 - Blue: $[-0.25, 0.25] \times [0, 4] \times [-0.25, 0.25]$,
 - Pink: $[-0.25, 0.25] \times [0, 3] \times [-0.25, 0.25]$,
 - Red: $[-0.25, 0.25] \times [0, 2] \times [-0.25, 0.25]$

In the starting code, the green cube is already defined in the model class. Use the corresponding colors to render these four bones. The linkage should be straight up initially as shown in the following figure: (Grade: 3 points)



- Support interactive control of the 9 DOFs. Here are two example poses to check your result:
(Grade: 6 points)
 - If we set the pose vector $(\theta_{Blue}^y, \theta_{Blue}^z, \theta_{Blue}^x, \theta_{Pink}^y, \theta_{Pink}^z, \theta_{Pink}^x, \theta_{Red}^y, \theta_{Red}^z, \theta_{Red}^x)$ to be $(0, 30, 0, 0, 30, 0, 0, 30, 0)$, with all the numbers in degrees, we get the following result:



- If we set the pose vector $(\theta_{Blue}^y, \theta_{Blue}^z, \theta_{Blue}^x, \theta_{Pink}^y, \theta_{Pink}^z, \theta_{Pink}^x, \theta_{Red}^y, \theta_{Red}^z, \theta_{Red}^x)$ to be $(0, -90, 0, 90, 90, 0, 0, 90, 0)$, with all the numbers in degrees, we get the following result:



- Have a reset button to reset the linkage to the initial state. (Grade: 1 point)

In the starting code, there are a green reference plane with center at $(0.0, -5.0, 0.0)$ and the green cube as the base of the linkage at the center of the plane as shown in the following figure:

