

Homework 1: Solution

initial_camera_transformation: $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

rotation1: $\begin{bmatrix} \cos(13\pi/18) & -\sin(13\pi/18) & 0 & 0 \\ \sin(13\pi/18) & \cos(13\pi/18) & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

translation: $\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

rotation2: $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos(\pi/9) & -\sin(\pi/9) & 0 \\ 0 & \sin(\pi/9) & \cos(\pi/9) & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

current_camera_transformation = rotation2 * (translation * (rotation1 * initial_camera_transformation))
 = $\begin{bmatrix} -0.64 & -0.76 & 0 & 2 \\ 0.71 & -0.6 & -0.34 & 2.47 \\ 0.26 & -0.21 & 0.93 & 1.96 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

In the above equation * represents matrix multiplication operation.

object_position_world = Transpose([2, 3, 4])

Homogeneous object_position_world = Transpose([2, 3, 4, 1])

object_position_camera = current_camera_transformation * Homogeneous object_position_world
 = $\begin{bmatrix} -0.64 & -0.76 & 0 & 2 \\ 0.71 & -0.6 & -0.34 & 2.47 \\ 0.26 & -0.21 & 0.93 & 1.96 \\ 0 & 0 & 0 & 1 \end{bmatrix} * \text{Transpose}([2, 3, 4, 1])$
 = **Transpose([-1.58, 0.73, 5.5, Ignore the last index since it's not part of the solution.])**

