

### Exercise #3: Object Transformation for Keyboard-based HCI

1. Download the [Ground.java](#) and [TransformTest.java](#) files, and check class *KeyEvent* for key constants from [Java API specifications](#) to prepare working on the *KeyListener* interface.
2. Modify `TransformTest.java` so that the cube translates along the negative (or positive) direction of the  $x$ -axis when the `t` (or `y`) key is pressed.

*Hints: Get the `Matrix4D` from the cube's `Transform3D`. Increase (or decrease) the  $x$  position by a small amount. Use method `SetTransform` to reset the cube's `TransformGroup`.*

3. Modify `TransformTest.java` so that the cube rotates around the  $y$ -axis when the `r` key is pressed.

*Hints: Get the `Matrix4D` from the cube's `Transform3D`. Create another `Matrix4D` with 1s on the diagonal. Use `Matrix4d`'s method `rotY` on your new `Matrix4D`. Multiply the matrices. Use method `SetTransform` to reset the cube's `TransformGroup`.*

4. When the `o` key is pressed, the cube returns to its original position and orientation as when the application starts. The actions should take place regardless of the cube's position along the  $x$ -axis.