Proseminar Visual Computing
Winter Semester 2020

Assignment 3
Hand-out: November 17, 2020
Hand-in: December 03, 2020

Topics

- General OpenGL programming
- ModelView and camera transformations
- Basic animation and user controls

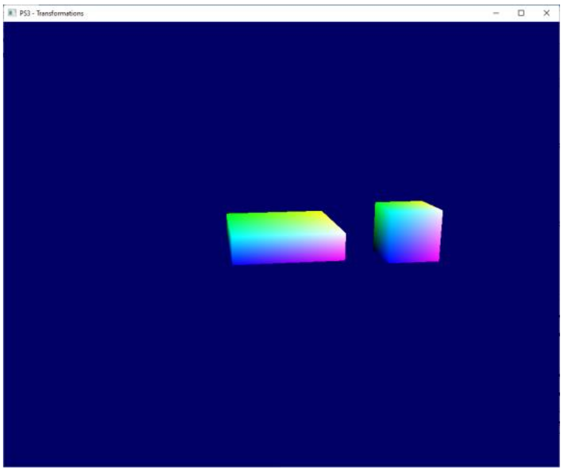
Outline

The goal of the Computer Graphics assignments of the Visual Computing PS is to build an animated robot arm. This work is divided in 3 steps. Each step corresponds to a programming assignment. In this first assignments, we focus on geometric transformations and animation. The objective of this first assignment is to build a simplified articulated arm made of basic geometric primitives (i.e. cubes) with rotations and translations.

Base code

A base code is provided with this assignment. You can modify this code to build your own scene. The functions to modify are all implemented in the main source file **assign_3.cpp**.

The scene described in the base code contains two cuboids. The first cuboid rotates at the center of the scene. The second cuboid rotates around the first one, as depicted in the figure bellow:



Tasks

1. Setup the hierarchical geometrical model of a robotic arm. You have to design a model from at least 3 cuboids or other geometrical shapes representing: static base, upper arm, lower arm, and a gripper or end effector (see picture below). Different colors are not required for this implementation.

2. Add animation to the arm. two animated transformations at least should be implemented. At least one rotation at each joint is required. The base plate should be static, while the motion of the arm segments should be either periodic (idle), or controlled by keyboard.

3. Add keyboard and/or mouse controls to move the camera around the scene, and to zoom-in/zoom-out. The zoom can be implemented either as a translation of the camera, or as a change in field-of-view angle.

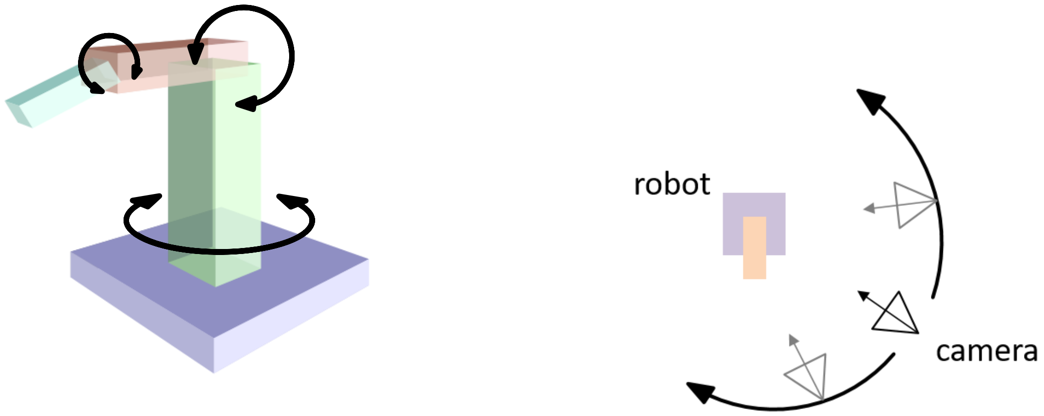


Figure 2: on the left, example of robot arm with animations. On the right, rotation of the camera around the scene.

Implementation Remarks

Make sure that your code is clear and readable. Write commentaries when necessary. Your solution should contain a readme file with name of the team members, list of keyboard controls, and any explanation that you think is necessary for the comprehension of the code.

Submission and Grading

Submission of your solution is due on December 3rd 2020 (23:59). **Submit the sources** (i.e. only the content of the *src* folder) in a ZIP archive via OLAT. Do not submit the executable and the content of the *build* folder. Do not submit the external dependencies either. Both folder and archive should be named according to the following convention:

Folder: **PA1_<lastname1>_<lastname2>_<lastname3>**

Archive: **PA1_<lastname1>_<lastname2>_<lastname3>.zip**,

where <lastname1>, etc. are family names of the team members. Development in teams of three students is requested. Please respect the academic honor code. In total there are 15 marks achievable in this assignment distributed as follows:

- Geometrical models (**4 marks**)
- Model and camera animation (**6 marks**)
- Keyboard/mouse controls **(3marks)**
- Code readability, comments, and proper submission: (**2 marks**)

Resources

- Lecture and Proseminar slides as well as code and information are available via OLAT.

- OpenGL homepage
  http://www.opengl.org

- OpenGL 3.3 reference pages
  https://www.khronos.org/registry/OpenGL/specs/gl/glspec33.core.pdf

- OpenGL Tutorial
  http://www.opengl-tutorial.org

- GL FrameWork GLFW
  https://www.glfw.org/documentation.html

Note: Be mindful of employed OpenGL and GLSL versions!