# Project 2: Hierarchical Transformations

## 1. Due Date

Project 2 is due on **09/29 11:59pm**

## 2. Requirements

You are required to write a program to create a robot. The body parts should be rotatable. Your program should allow users to select and rotate body parts. An executable of this project (*.exe*) created by the instructor has been uploaded to *mycourses*. Please run it and get a feel of the work you are expected to deliver. You are required to write C++ program, and you are free to use either OpenGL, D3D, Vulkan for this project. Game engines like Unity are not allowed.

The robot must have at least **16 body parts**. An illustration of the robot is shown in figures below. Figure (A) shows the body parts of the robot. Figure (B) shows the relationships of these body parts through a skeletal hierarchy. The skeletal hierarchy represents a local child-parent relationship of transformations between body parts.

To meet the requirement of this project, the number of body parts cannot be less than 16, and the skeletal hierarchy cannot be simpler than the illustration in Figure (B). Shapes of the body parts are not necessary to be the same as the figure. Feel free to design a better-looking robot and a more sophisticated skeletal hierarchy.

You are expected to finish the project in 2D. If you are confident in creating a rotatable 3D robot, please go ahead to do so.

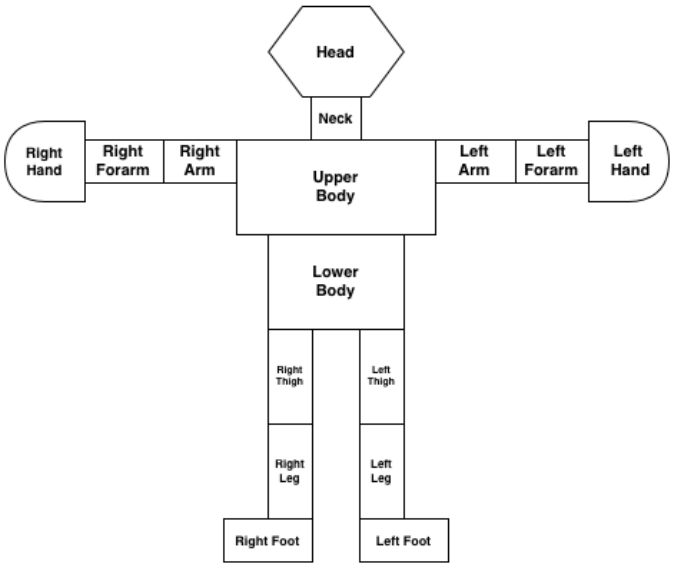


**Figure (A)**

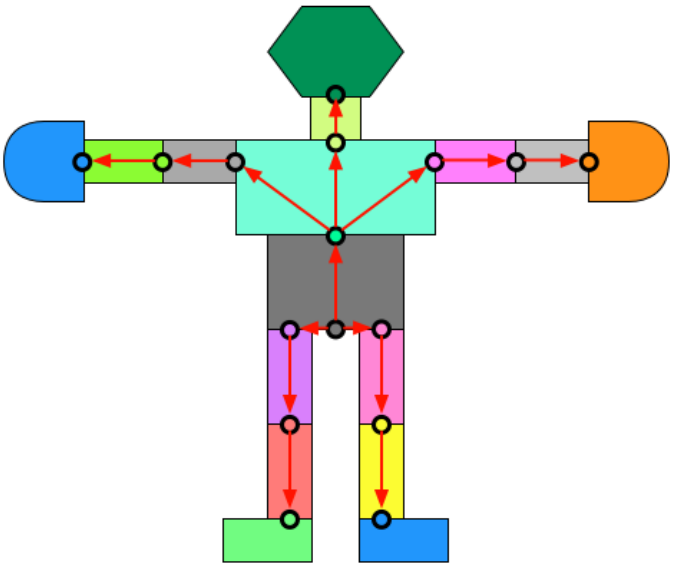

**Figure (B)**

## 3. Assessment

**3.1. (80pts) Transformation:** You program must correctly control the rotations of the 16 body parts. Note that the coordinates of a child part should be defined in the coordinate system of its parent, as shown in (B).

**3.2.(20pts) Body Part Selection:** You program must allow users to select and rotate a particular body part. For example, you may use a key on the keyboard to cycle through the indices of body parts, and then use another key for rotation.

## 4. Submission

Upload the following three things to *mycourses*:

(1) A document explaining how to set up your code in Visual Studio if not done with OpenGL.
(2) A document explaining how to select and rotate a body part in your program.
(3) A *.zip* file containing all source files (*.h* and *.cpp* files).