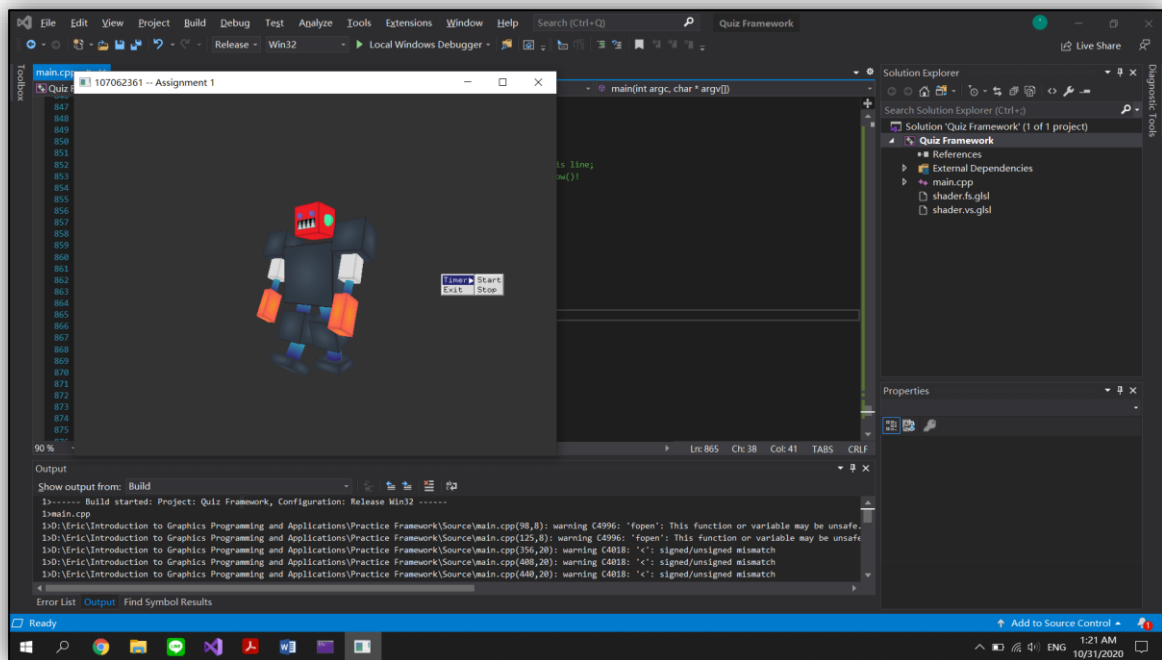# Introduction to Graphics Programming and its Applications
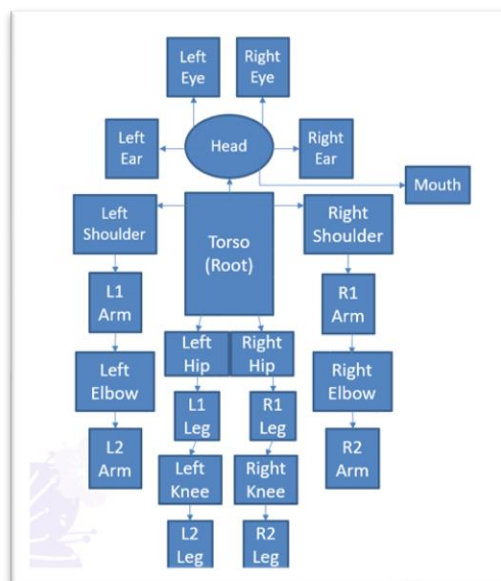
Assignment 1

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■ **1 screenshot of your window with robot in it**

■ **The relationship/transformation stack of your robot body parts(example on previous page)**

$Torso = P * V * M_{torso}$

$Head = P * V * M_{torso} * M_{head}$

$Left\ Ear = P * V * M_{torso} * M_{head} * M_{left\ ear}$

$Right\ Ear = P * V * M_{torso} * M_{head} * M_{right\ ear}$

$Left\ Eye = P * V * M_{torso} * M_{head} * M_{left\ eye}$

$Right\ Eye = P * V * M_{torso} * M_{head} * M_{right\ eye}$

$Mouth = P * V * M_{torso} * M_{head} * M_{mouth}$

$Left\ Shoulder = P * V * M_{torso} * M_{left\_shoulder}$

$L1\ Arm = P * V * M_{torso} * M_{left\_shoulder} * M_{L1\ Arm}$

$Left\ Elbow = P * V * M_{torso} * M_{left\_shoulder} * M_{L1\ Arm} * M_{left\_elbow}$

$L2\ Arm = P * V * M_{torso} * M_{left\_shoulder} * M_{L1\ Arm} * M_{left\_elbow} * M_{L2\ Arm}$

$Right\ Shoulder = P * V * M_{torso} * M_{Right\_shoulder}$

$R1\ Arm = P * V * M_{torso} * M_{Right\_shoulder} * M_{R1\ Arm}$

$Right\ Elbow = P * V * M_{torso} * M_{Right\_shoulder} * M_{R1\ Arm} * M_{right\_elbow}$

$R2\ Arm = P * V * M_{torso} * M_{Right\_shoulder} * M_{R1\ Arm} * M_{right\_elbow} * M_{R2\ Arm}$

$Left\ Hip = P * V * M_{torso} * M_{left\_hip}$

$L1\ Leg = P * V * M_{torso} * M_{left\_hip} * M_{L1\ Leg}$

$Left\ Knee = P * V * M_{torso} * M_{left\_hip} * M_{L1\ Leg} * M_{left\_knee}$

$L2\ Leg = P * V * M_{torso} * M_{left\_hip} * M_{L1\ Leg} * M_{left\_knee} * M_{L2\ Leg}$

$Right\ Hip = P * V * M_{torso} * M_{right\_hip}$

$R1\ Leg = P * V * M_{torso} * M_{right\_hip} * M_{R1\ Leg}$

$Right\ Knee = P * V * M_{torso} * M_{right\_hip} * M_{R1\ Leg} * M_{right\_knee}$

$R2\ Leg = P * V * M_{torso} * M_{right\_hip} * M_{R1\ Leg} * M_{right\_knee} * M_{R2\ Leg}$

■ **Functions in your program/how to use, which IDE and its version do you use, etc.**

Keyboard Functions:
- W : move robot position to top.
- A : move robot position to left.
- S : move robot position to bottom.
- D : move robot position to right.
- Q : zoom in robot.
- E : zoom out robot.

IDE : Visual Studio 2019
Version : 16.6.5

Mouse Functions :
- Right click : show GLUT menus that can start/pause animation.