Computer Graphic Assignment 1 Report

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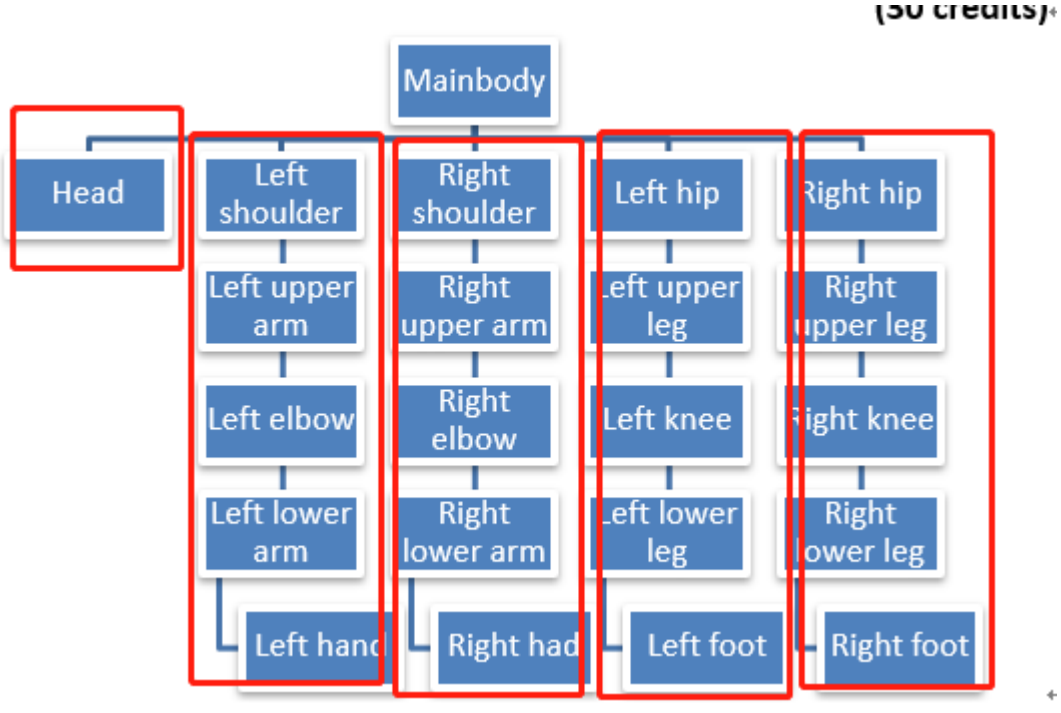
a) OpenGL version: 4.0
GLUT Version: 3.7
Freeglut: freeglut 2.8.1-1.mp for MSVC
Windows version: Windows 10
Visual Studio version: Visual Studio 2017

b) First, I separate function for draw the head, shoulders and Knees, body, arms and legs.
In the highest hierarchical I have:

```
void DrawRobot() {
    glPushMatrix();
    glTranslatef(0, 10, 0);
    DrawHead();//head
    glTranslatef(0, -10, 0);
    SetColor(0, 0, 1);
    DrawCylinder(1.2,7);//body
    glTranslatef(3, 6, 0);
    DrawLeftArm(12,0.8);//left arm
    glTranslatef(-6, 0, 0);
    DrawArmAndLeg(-12, 0.8,12);//right arm
    glTranslatef(1.5, -8, 0);
    DrawArmAndLeg(0, 1,0);//left leg
    glTranslatef(3, 0, 0);
    DrawArmAndLeg(0, 1,0);//right leg
    glPopMatrix();
}
```

Which represent

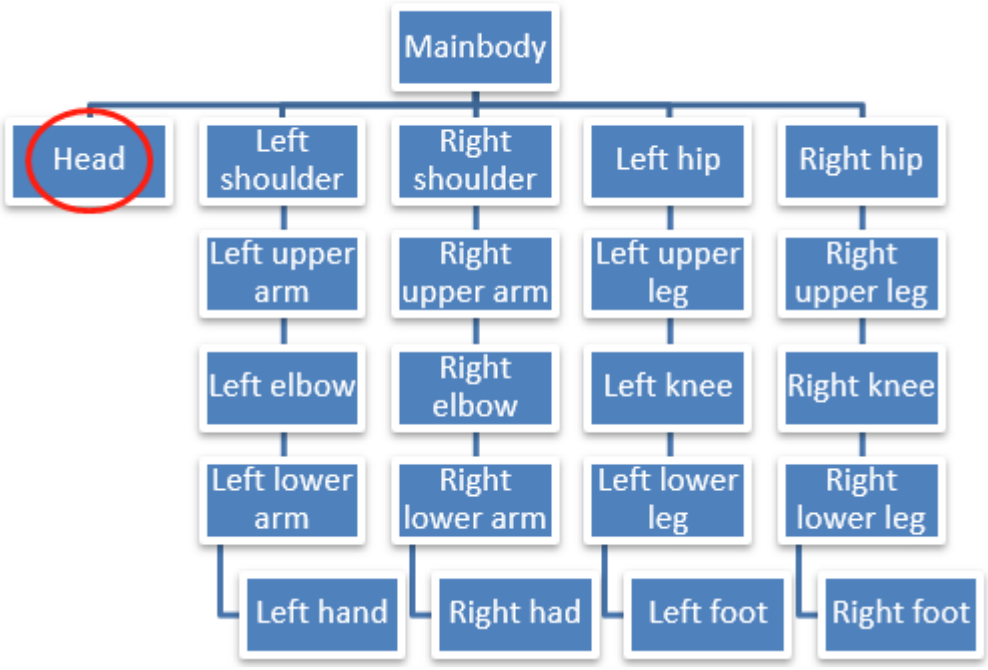


Then

```
void DrawHead() {
    SetColor(1, 0, 0);
    glutSolidSphere(2, 16, 16);
}
```

Represent

(30 credits



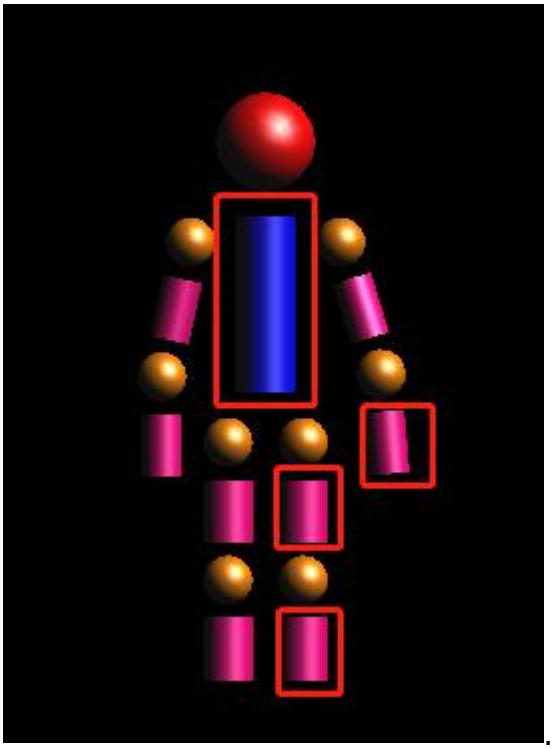

```
void DrawArmAndLeg(GLfloat angle,GLfloat radius, GLfloat secondAngle) {
    glPushMatrix();
    glRotatef(angle, 0, 0, 1);
    DrawShouldAndKnee();
    glTranslatef(0, -4, 0);
    SetColor(1, 0, 0.5);
    DrawCylinder(radius, 2.5);
    glTranslatef(0, -1.5, 0);
    glRotatef(secondAngle, 0, 0, 1);
    DrawShouldAndKnee();
    glTranslatef(0, -4, 0);
    SetColor(1, 0, 0.5);
    DrawCylinder(radius, 2.5);
    glPopMatrix();
}
```

For draw whole arm or leg.

```
void DrawCylinder(GLfloat radius, GLfloat height) {
    glPushMatrix();
    glRotatef(90, -1, 0, 0);
    GLUquadricObj *objCylinder = gluNewQuadric();

    gluCylinder(objCylinder, radius, radius, height, 32, 5);
    glColor3f(0, 1, 0);
    glBegin(GL_POLYGON);
    int n = 100;
    for (int i = 0; i < n; i++)
    {
        glVertex2f(radius * cos(2 * 3.14 / n * i), radius * sin(2 * 3.14 / n * i));
    }
    glEnd();
    glTranslatef(0, 0, height);
    glBegin(GL_POLYGON);
    for (int i = 0; i < n; i++)
    {
        glVertex2f(radius * cos(2 * 3.14 / n * i), radius * sin(2 * 3.14 / n * i));
    }
    glEnd();
    glPopMatrix();
}
```

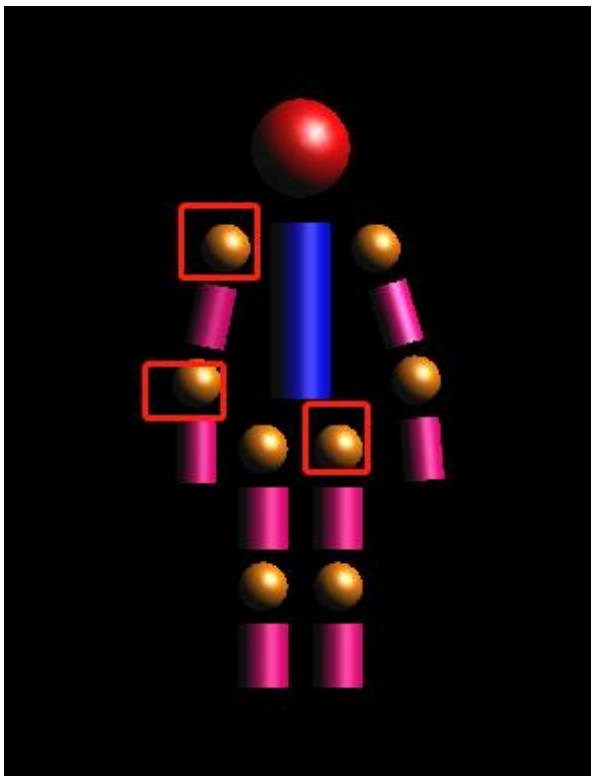
For draw body and single arm or leg



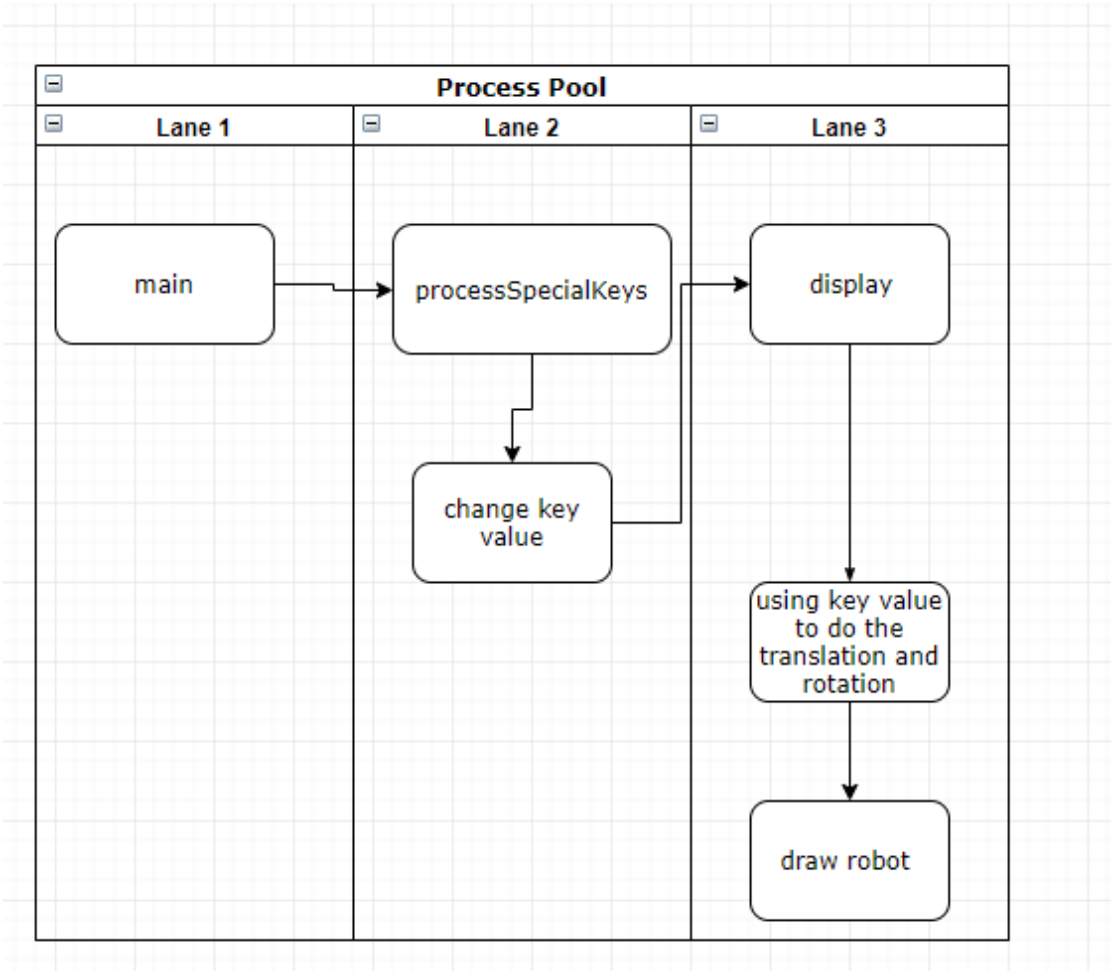
And

```
void DrawShouldAndKnee() {
    SetColor(1, 0.5, 0);
    glutSolidSphere(1, 16, 16);
}
```

For shoulders and knees.

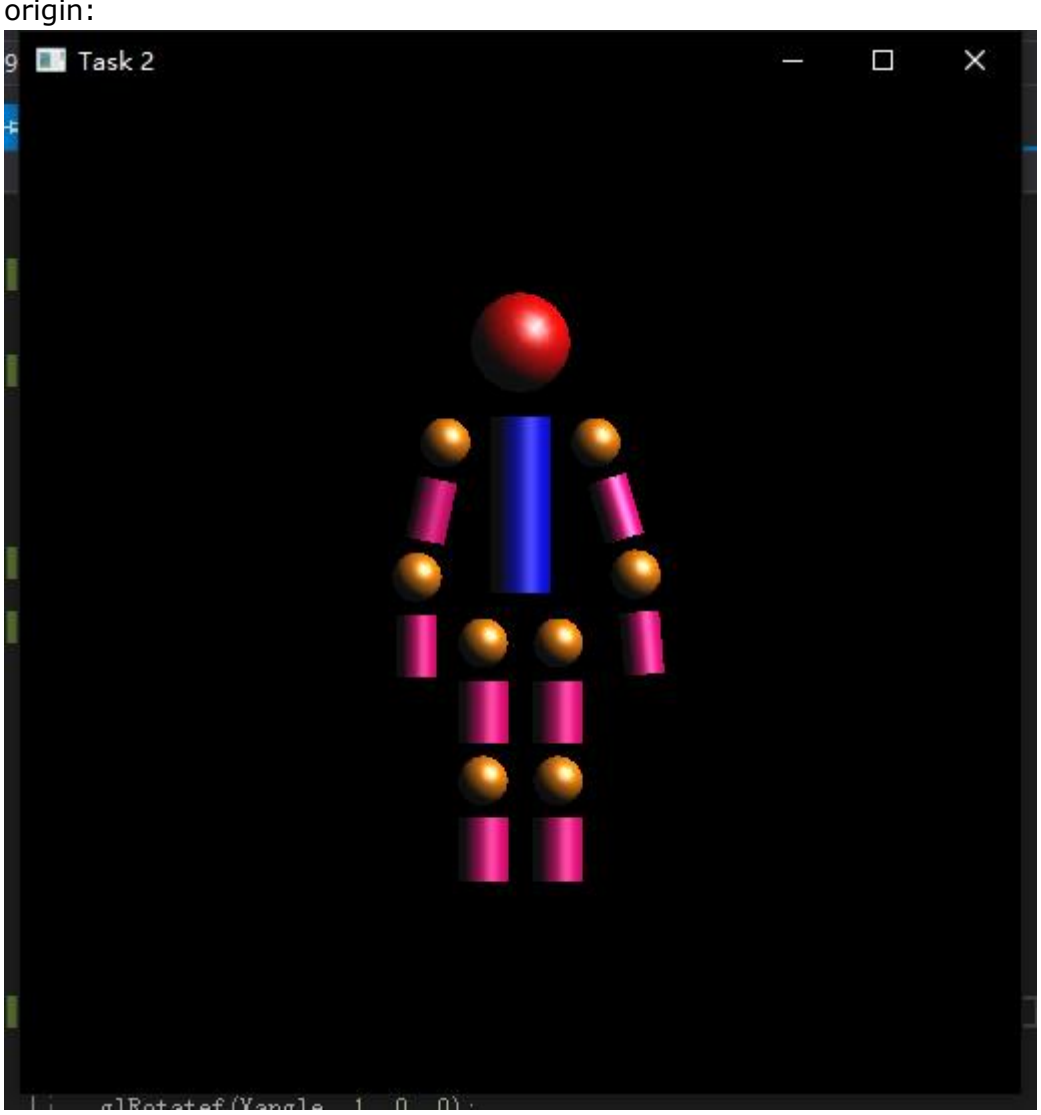


c) Structure of program

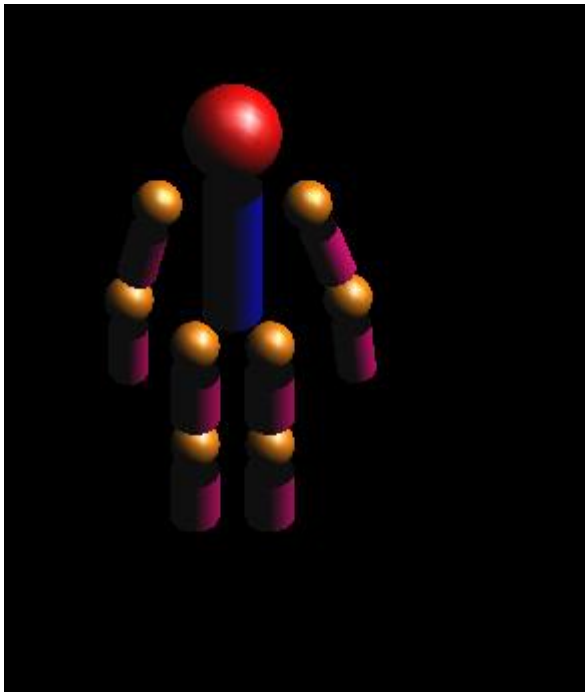


d) X: rotate about x-axis
Y: rotate about y-axis
Z: rotate about z-axis
A: rotate lower arm
S: rotate lower arm opposite
Q: rotate upper arm
W: rotate upper arm opposite
D: rotate forward lower arm
F: rotate backward lower arm
E: rotate forward upper arm
R: rotate backward upper arm
2,4,6,8: translate down left right and up (using num keyboard)
5: translate forward
0: translate backward
'space': reset all state

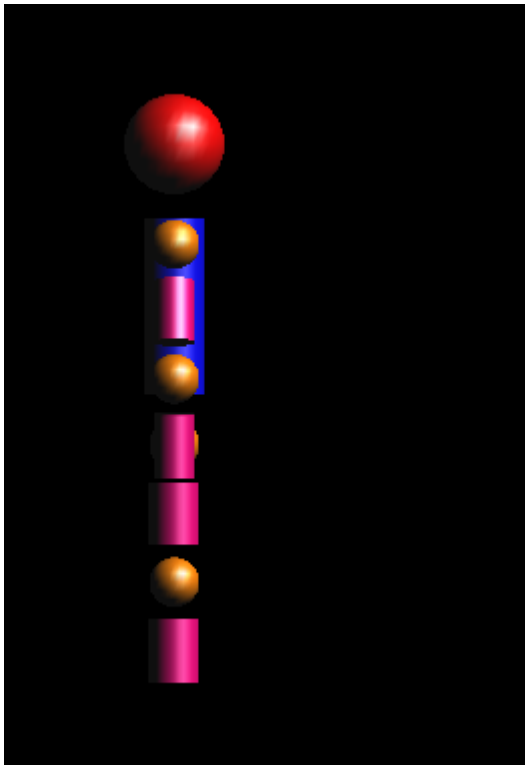
e)
origin:



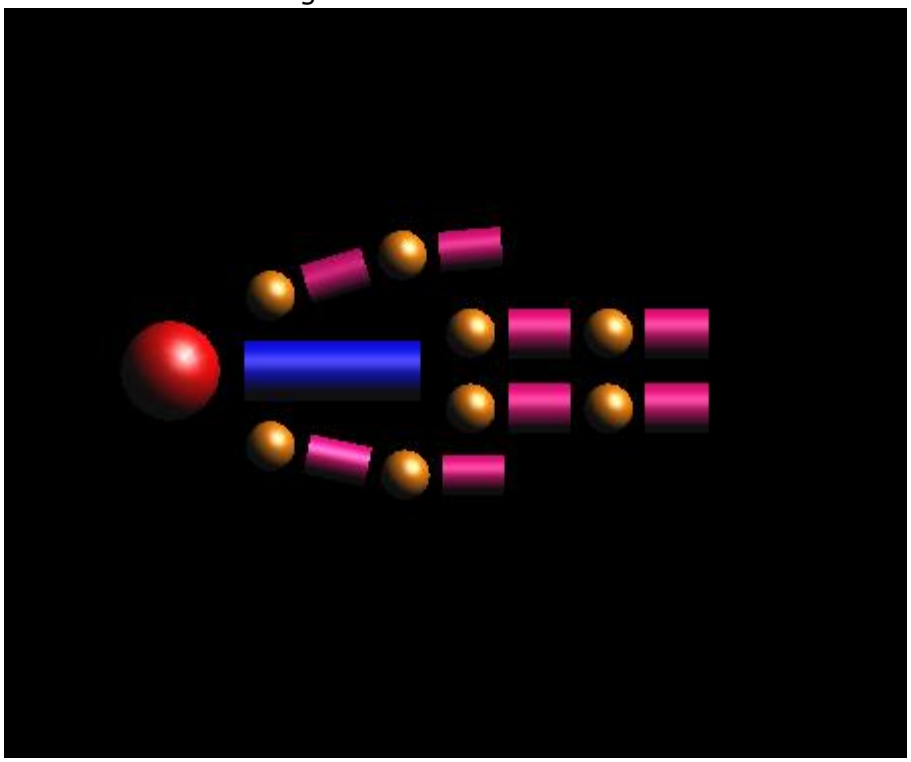
rotate about x 45 degree



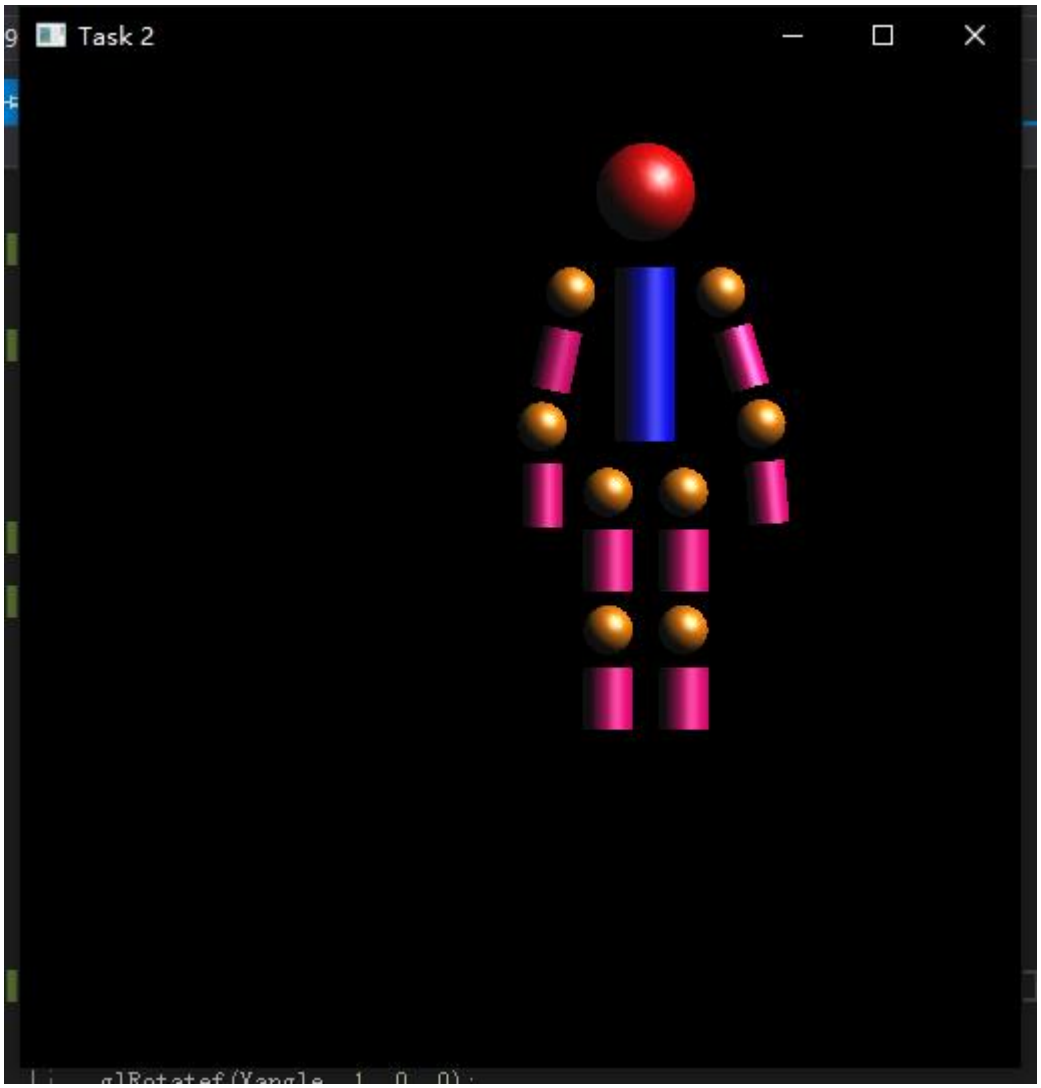
Rotate about y 90 degree



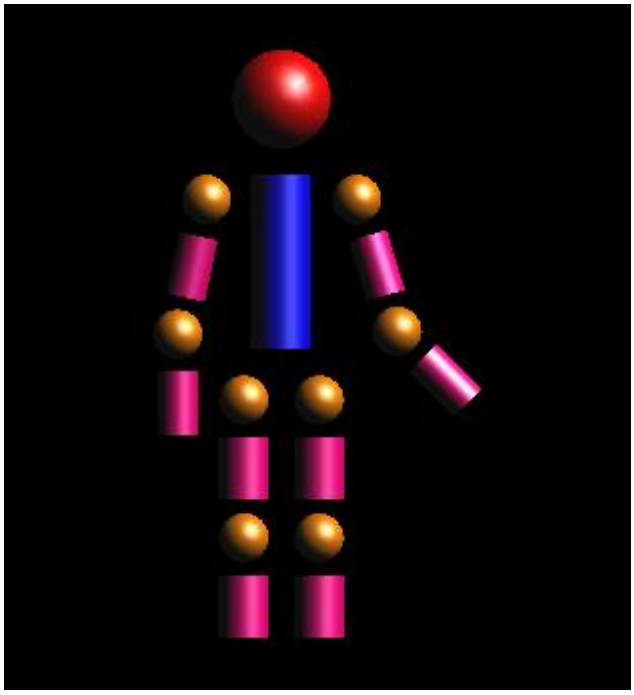
Rotate about z 90 degree



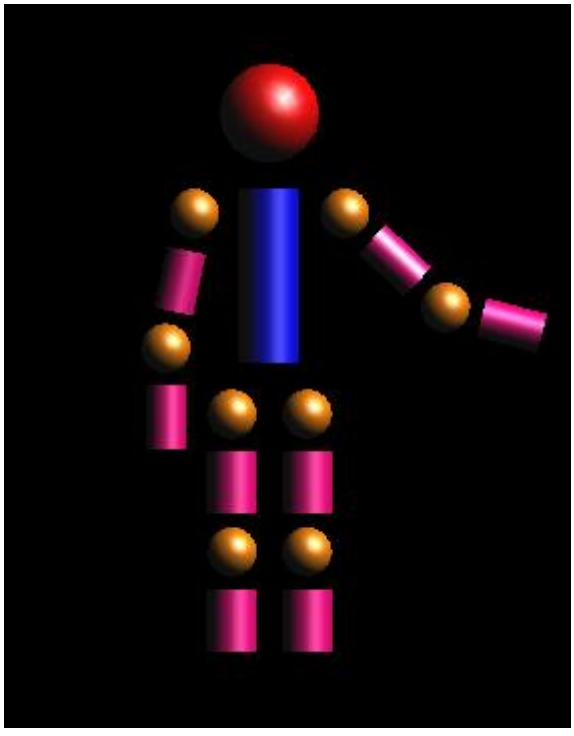
Move:



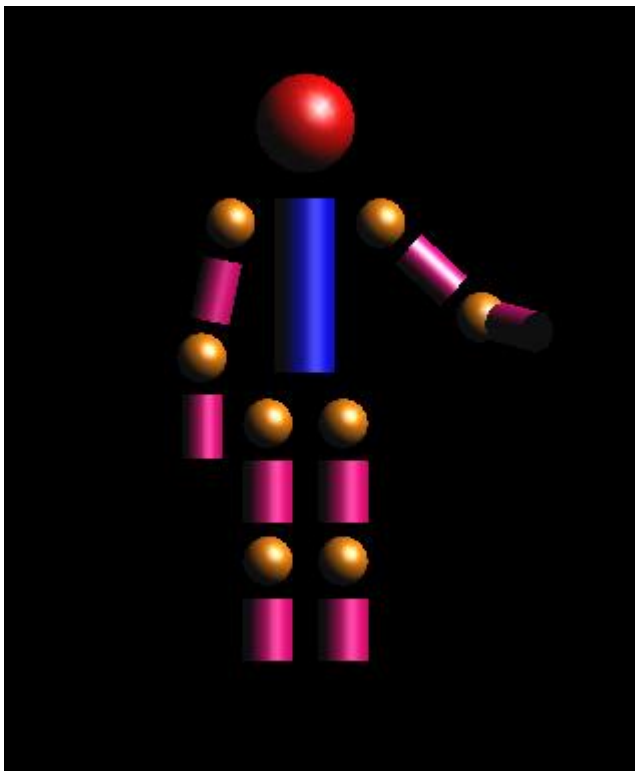
Raise lower arm:

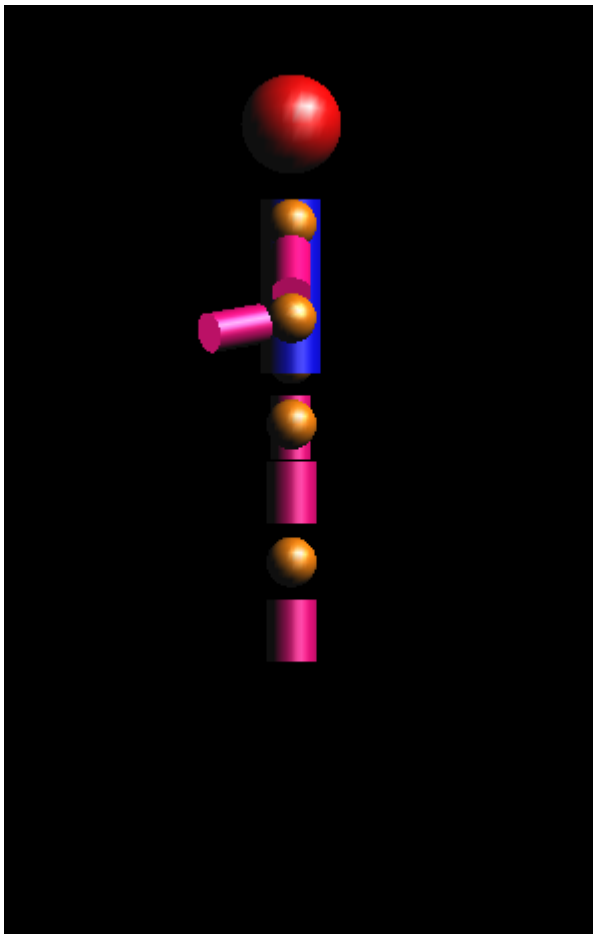


Raise upper arm:

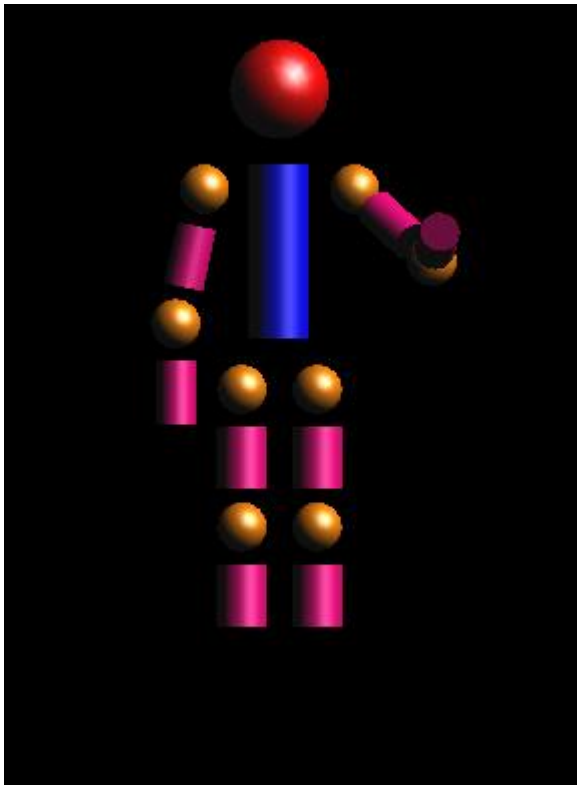


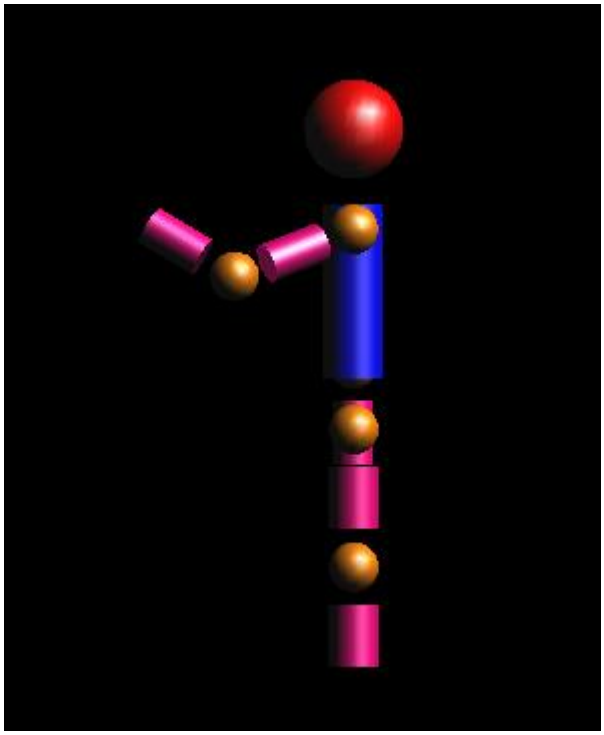
Move lower arm forward:





Move upper arm forward:





RESET: