

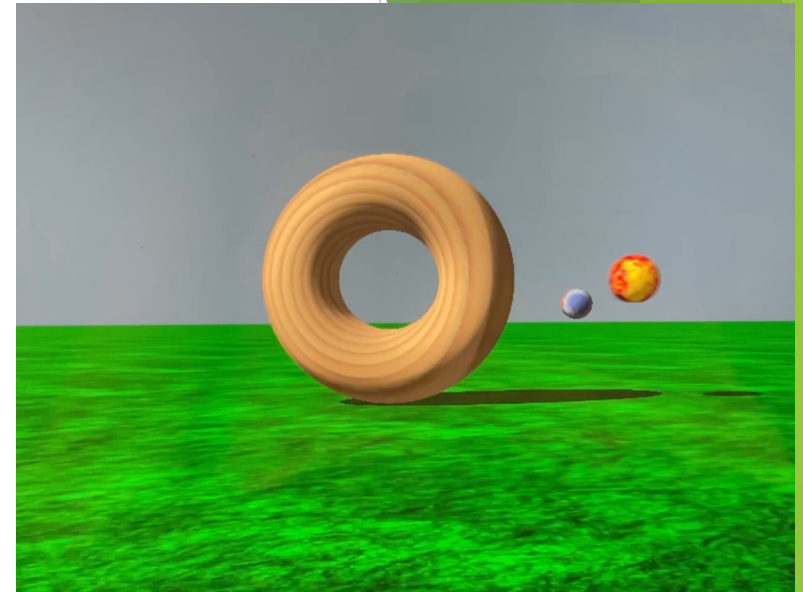
The background features abstract green geometric shapes. On the left is a tall, narrow, light green triangle pointing downwards. On the right is a complex, multi-layered green shape composed of various overlapping triangles and polygons in different shades of green. A thin, light gray line extends from the bottom left towards the right, passing behind the green shapes.

Lab 10

Animation

Sphere World

- ▶ Modify the source file `sphereworld.cpp` so that it can run without extra header files.
- ▶ Modify the scene:
 1. Create an animated giant robot and place it in the center of the scene
 - ▶ The arms/ torso/ legs can be controlled individually
 2. Attach the wood texture to the robot (part of it or all)
 3. The robot should also have its shadow
- ▶ Timer
 - ▶ Use a key to pause/unpause the animation

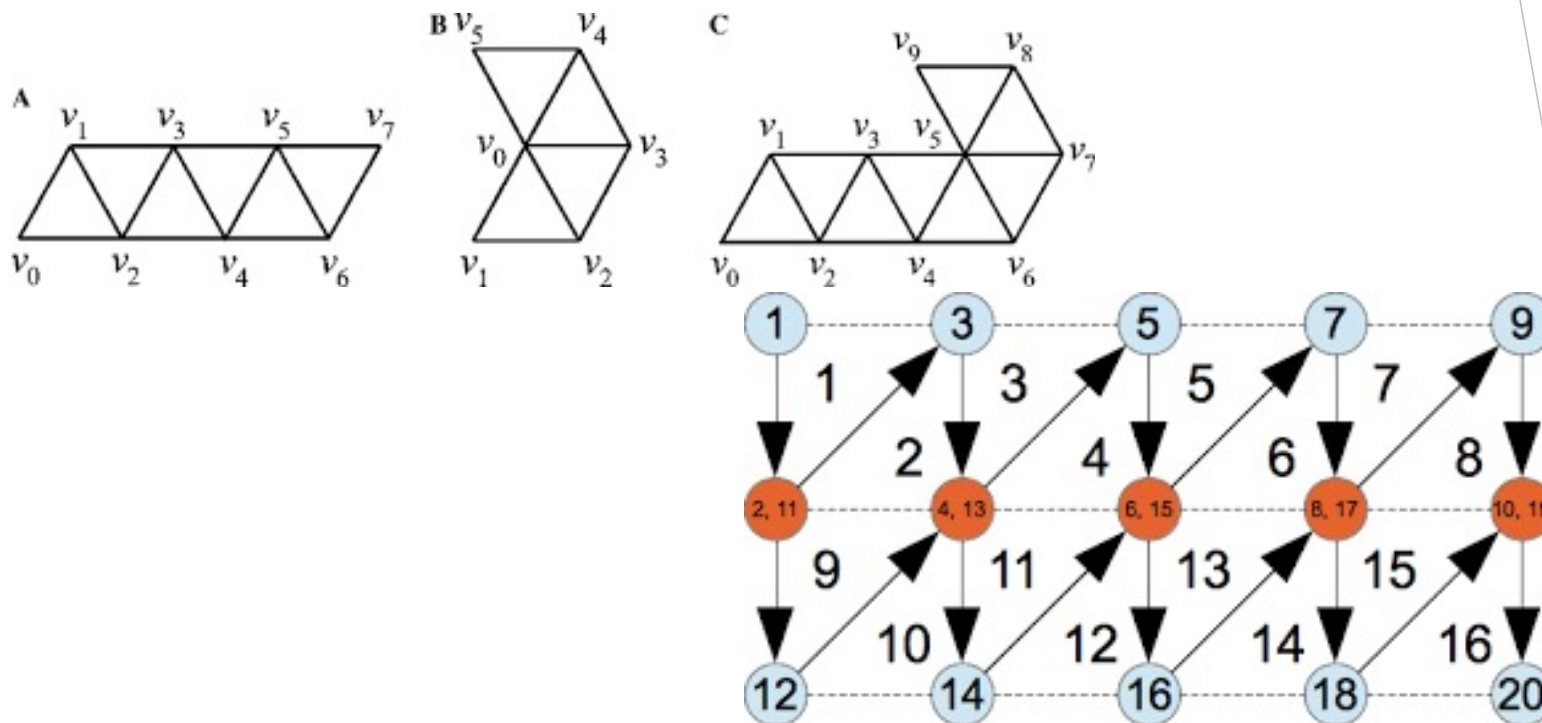


Super bible v4. example code : shadow

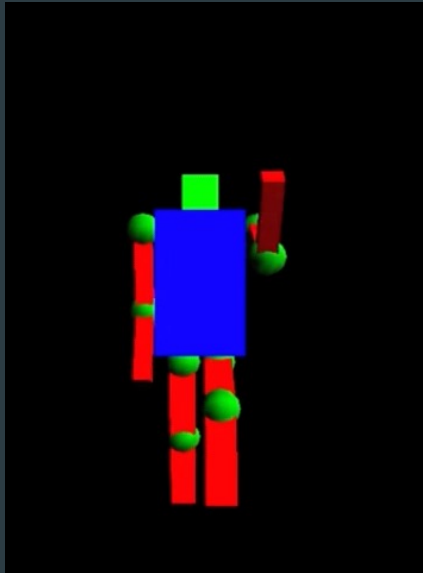


Submit your code (`sphereworld.cpp` only)
, a demo video, and a pdf document

TRIANGLE_STRIP



glPushMatrix glPopMatrix



Skeleton - Hierarchical Representation

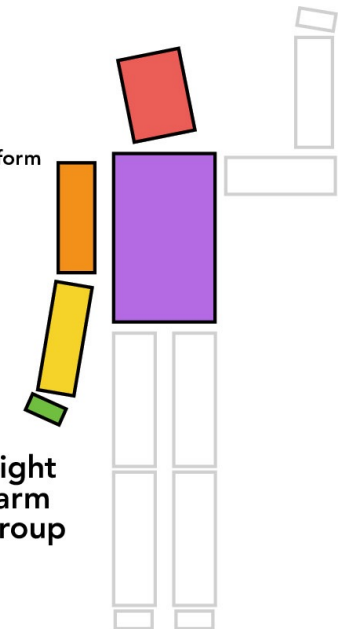
```

translate(0, 10);
drawTorso();
pushmatrix(); // push a copy of transform onto stack
  translate(0, 5); // right-multiply onto current transform
  rotate(headRotation); // right-multiply onto current transform
  drawHead();
popmatrix(); // pop current transform off stack
pushmatrix();
  translate(-2, 3);
  rotate(rightShoulderRotation);
  drawUpperArm();
  pushmatrix();
    translate(0, -3);
    rotate(elbowRotation);
    drawLowerArm();
    pushmatrix();
      translate(0, -3);
      rotate(wristRotation);
      drawHand();
    popmatrix();
  popmatrix();
popmatrix();
....
  
```

right
hand

right
lower
arm
group

right
arm
group



Animation in GLUT

```
void glutTimerFunc( unsigned int msecs ,  
                   void (*func)(int value),  
                   value);
```

glutTimerFunc

- ▶ Registers a timer callback to be triggered in a specified number of milliseconds
- ▶ Only called once!
- ▶ Multiple timer callbacks at same or differing times
- ▶ Call *glutPostRedisplay* to refresh the screen

```
void MyTimerFunc(int value)  
{  
    glutPostRedisplay();  
    glutTimerFunc(100, MyTimerFunc, 1);  
}
```

http://openglut.sourceforge.net/group__idletimer.html

My_Timer() - Code snippet

```
////////////////////////////////////  
// Called by GLUT library when the special keyboard event is triggered  
void My_Timer( int value )  
{  
    if(value == 0) return;  
  
    timer_cnt++;  
    timer_cnt = timer_cnt % 256;  
  
    glutPostRedisplay();  
    glutTimerFunc(timer_speed, My_Timer, timer_flag);  
}
```

Stop / Resume timer

```
case 'p' : case 'P':  
    /// stop/resume timer  
    if(timer_flag == 0)  
    {  
        timer_flag = 1;  
        glutTimerFunc(timer_speed, My_Timer, timer_flag);  
    }  
    else  
        timer_flag = 0;  
    break;
```