USC

CSCI 420 HW1 Height Field

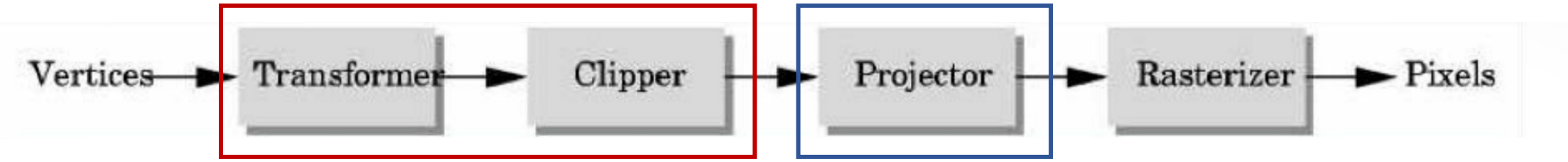
Camera Manipulation

TA: Cho-Ying Wu, Jiayi Liu

Professor: Andrew Nealen

Q1: Where are “camera manipulations” involved?

OpenGL Viewing Functions



transfer objects from world coordinate system to camera coordinate system

project objects onto the image plane

Three steps to set up viewing functions

Step 1: Position the camera/eyes

- LookAt function: orientation, head pose
- Set the model-view matrix with translation, rotation, and scaling
- Imagine as moving the camera but actually moving the scene

Step 2: Select a lens

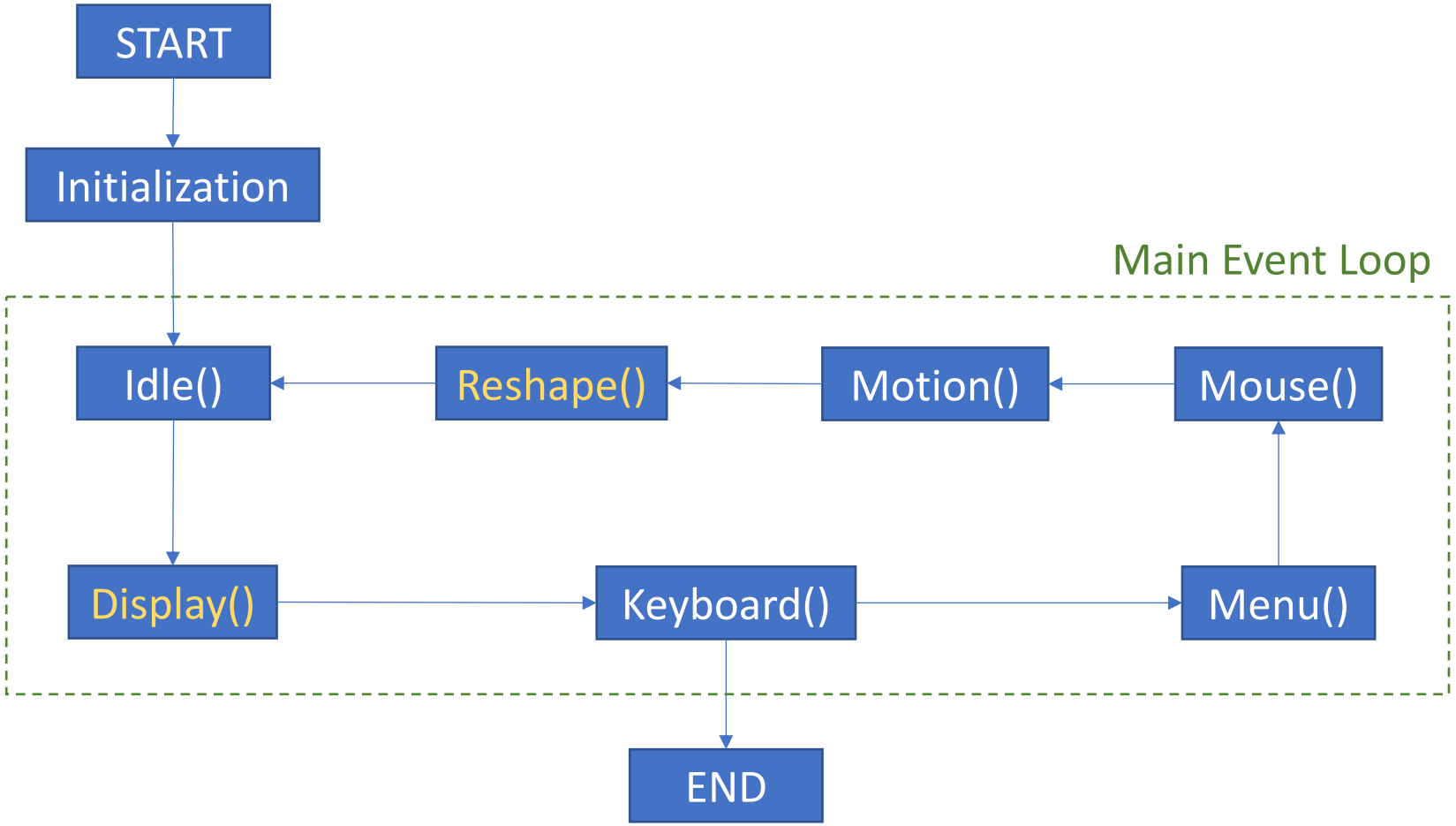
- Set the projection matrix: fov

Step 3: Clipping

- Set the view volume
- OpenGL specifies a default view volume that is a cube with sides of length 2 centered at the origin

Q2: How do we implement it in a GLUT program?

GLUT Program



display()

```
{
   // clear the background color and set depths to infinity
   glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
   // set camera
   setCamera();
   // draw objects
   draw();
   // double buffer
   glutSwapBuffers();
}
```

setCamera()

```
{
   // set matrix mode to model-view NOT projection
   glMatrixMode(GL_MODELVIEW)
   // reset the state to identity matrix
   glLoadIdentity();
   // place the camera, typically points in negative z-axes and head up in y-axes
   gluLookAt(eyex, eyey, eyez, centerx, centery, centerz, upx, upy, upz);
   // translation
   glTranslatef(g_vLandTranslate[0], g_vLandTranslate[1], g_vLandTranslate[2]);
   // rotation
   glRotatef(g_vLandRotate[0], 1, 0, 0);
   glRotatef(g_vLandRotate[1], 0, 1, 0);
   glRotatef(g_vLandRotate[2], 0, 0, 1);
   // scaling
   glScalef(g_vLandScale[0], g_vLandScale[1], g_vLandScale[2]);
}
```

reshape(int w, int h)

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```
{
    // set view port of the screen
    glViewport(0, 0, w, h);
    // set the matrix mode to projection
    glMatrixMode(GL_PROJECTION);
    // reset the matrix state to identity matrix
    glLoadIdentity();
    // if use perspective projection, z-clipping usually between 0.1f to 100.0f
    gluPerspective(fov, w / h, zNear, zFar);
    // set the matrix mode back to model-view mode
    glMatrixMode(GL_MODELVIEW);
    glLoadIdentity();
}
```

Don’t forget to register it in the main() with glutReshapeFunc(reshape)

Thanks for Watching