



```

29     self.tex_coords = [[0.0, 0.0], [1.0, 0.0], [1.0, 1.0],
30                        [0.0, 1.0], [0.0, 0.0], [1.0, 0.0],
31                        [1.0, 1.0], [0.0, 1.0]]
32     # 使用OpenGL作石墙6个面, 对应的顶点作图顺序
33     # front - right - back - left - top - bottom
34     self-surfaces = [[0, 1, 2, 3], [1, 5, 6, 2],
35                     [5, 4, 7, 6], [0, 3, 7, 4],
36                     [3, 2, 6, 7], [1, 0, 4, 5]]
37
38     def init(self):
39         glClearColor(0.0, 0.0, 0.0, 1.0)
40         # depth test
41         glEnable(GL_DEPTH_TEST)
42         glDepthFunc(GL_LEQUAL)
43         # set texture
44         # 设置石墙的纹理
45         img = Image.open("stone_wall.png")
46         img_data = numpy.asarray(img, dtype=numpy.uint8)
47
48         self.texture_id = glGenTextures(1)
49         glBindTexture(GL_TEXTURE_2D, self.texture_id)
50         glTexParameterf(GL_TEXTURE_2D, GL_TEXTURE_WRAP_S, GL_REPEAT)
51         glTexParameterf(GL_TEXTURE_2D, GL_TEXTURE_WRAP_T, GL_REPEAT)
52         glTexParameterf(GL_TEXTURE_2D, GL_TEXTURE_WRAP_R, GL_REPEAT)
53         glTexParameterf(GL_TEXTURE_2D, GL_TEXTURE_MAG_FILTER, GL_LINEAR)
54         glTexParameterf(GL_TEXTURE_2D, GL_TEXTURE_MIN_FILTER, GL_NEAREST)
55         glTexImage2D(GL_TEXTURE_2D, 0, GL_RGBA, img.size[0], img.size[1],
56                    0, GL_RGB, GL_UNSIGNED_BYTE, img_data)
57         glEnable(GL_TEXTURE_2D)
58         glTexEnvf(GL_TEXTURE_ENV, GL_TEXTURE_ENV_MODE, GL_DECAL)
59         glBindTexture(GL_TEXTURE_2D, self.texture_id)
60
61     def reshape(self, w, h):
62         self.win_width = max(1, w)
63         self.win_height = max(1, h)
64         # set viewport
65         # 设置视口
66         glViewport(0, 0, self.win_width, self.win_height)
67
68         # 设置投影
69         glMatrixMode(GL_PROJECTION)
70         glLoadIdentity()
71
72         if self.win_width > self.win_height:
73             glOrtho(self.view[0] * self.win_width / self.win_height,
74                    self.view[1] * self.win_width / self.win_height,
75                    self.view[2], self.view[3],
76                    self.view[4], self.view[5])
77         else:
78             glOrtho(self.view[0], self.view[1],
79                    self.view[2] * self.win_height / self.win_width,
80                    self.view[3] * self.win_height / self.win_width,
81                    self.view[4], self.view[5])
82
83         # set MODELVIEW
84         glMatrixMode(GL_MODELVIEW)
85         glLoadIdentity()
86         # set camera

```

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87     # 设置视点
88     gluLookAt(
89         self.eye[0], self.eye[1], self.eye[2],
90         self.look_at[0], self.look_at[1], self.look_at[2],
91         self.eye_up[0], self.eye_up[1], self.eye_up[2]
92     )
93
94     def draw(self):
95         glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT)
96         glMatrixMode(GL_MODELVIEW)
97
98         glBegin(GL_QUADS)
99
100        # 依次画出石墙的6个面
101        # 并添加纹理
102
103        # front
104        glNormal3f(0.0, 0.0, 1.0)
105        for point in self.surfaces[0]:
106            glTexCoord2fv(self.tex_coords[point])
107            glVertex3fv(self.vertexes[point])
108        # back
109        glNormal3f(0.0, 0.0, -1.0)
110        for point in self.surfaces[2]:
111            glTexCoord2fv(self.tex_coords[point])
112            glVertex3fv(self.vertexes[point])
113        # right
114        glNormal3f(1.0, 0.0, 0.0)
115        glTexCoord2f(0.7, 0.0)
116        glVertex3fv(self.vertexes[5])
117        glTexCoord2f(1.0, 0.0)
118        glVertex3fv(self.vertexes[1])
119        glTexCoord2f(1.0, 1.0)
120        glVertex3fv(self.vertexes[2])
121        glTexCoord2f(0.7, 1.0)
122        glVertex3fv(self.vertexes[6])
123        # left
124        glTexCoord2f(0.3, 0)
125        glVertex3fv(self.vertexes[4])
126        glTexCoord(0.0, 0.0)
127        glVertex3fv(self.vertexes[0])
128        glTexCoord(0.0, 1.0)
129        glVertex3fv(self.vertexes[3])
130        glTexCoord(0.3, 1.0)
131        glVertex3fv(self.vertexes[7])
132        # top
133        glTexCoord(0.0, 1.0)
134        glVertex3fv(self.vertexes[3])
135        glTexCoord(1.0, 1.0)
136        glVertex3fv(self.vertexes[2])
137        glTexCoord(1.0, 0.7)
138        glVertex3fv(self.vertexes[6])
139        glTexCoord(0.0, 0.7)
140        glVertex3fv(self.vertexes[7])
141        # bottom
142        glTexCoord(1.0, 0.0)
143        glVertex3fv(self.vertexes[1])
144        glTexCoord(0.0, 0.0)

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145         glVertex3fv(self.vertexes[0])
146         glTexCoord(0.0, 0.3)
147         glVertex3fv(self.vertexes[4])
148         glTexCoord(1.0, 0.3)
149         glVertex3fv(self.vertexes[5])
150
151     glEnd()
152     glFlush()
153
154
155 def main():
156     graph = Stonewall()
157
158     glutInit()
159     glutInitDisplayMode(GLUT_ALPHA | GLUT_SINGLE | GLUT_DEPTH)
160     glutInitWindowSize(400, 400)
161     glutInitWindowPosition(200, 200)
162     glutCreateWindow("Stone wall")
163
164     graph.init()
165     glutDisplayFunc(graph.draw)
166     glutReshapeFunc(graph.reshape)
167     glutMainLoop()
168
169
170 if __name__ == '__main__':
171     main()
172

```

## 运行效果

