

1. Introduction

2021 is the 15th anniversary of Xi'an Jiaotong Liverpool University. To celebrate this anniversary, I create a card named "Celebrating 15th anniversary of XJTU". In this card, I set up several models like Functional Building, balloon, sun, grass, tree and so on.

The Functional Building is earliest building of XJTU, so I choose it to be the primary model. It is a 2D graphic that can be operated in different methods (in next part, I will introduce how to run it). Sun means that XJTU is like a young adult (just 15 years old), is going to be a university with strong comprehensive strength. It might rank into Top 30 Chinese universities in the future. The grass and tree representing new life. The animated balloons are created to celebrate the 15th birthday of XJTU. The celebrating card is created in this thought.

I use the knowledge that we have learnt in the lecture and lab to build this card. I use functions like `MatrixMode`, `glFlush` to clear buffer, `glViewport` and `glOrtho` to define the coordinates and window etc. I use `glVertex2f` and `glBegin(GL_POLYGON)`; to create models like grass, sun, and so on. I use `glColor3ub` to color the building models. I search the parameter of colors in the Internet to define which color should be used. The link is <https://coolors.co/>

```
int main(int argc, char** argv)
{
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB);
    glutInitWindowSize(width, height);
    glutInitWindowPosition(100, 0);
    glutCreateWindow("Celebrating 15th anniversary of XJTU");

    gluOrtho2D(0, width, 0, height);
    glViewport(0, 0, width, height);

    glutDisplayFunc(Display);
    glutIdleFunc(when_in_mainloop);
    glutKeyboardFunc(keyboard_input);
    glutTimerFunc(time_interval, OnTimer, 1);

    glutMainLoop();
}
```

I also add a time callback function to update parameter with a pre-set gap, a keyboard callback function to receive keyboard input and a mouse callback function to receive mouse input. Thus, you can use keyboard and mouse to control the models.

For background, I use gradually varied color (blue) to make it beautiful.

```

void Background()
{
    glBegin(GL_POLYGON);
    glColor3f(1, 1, 1);
    glVertex2f(0, 0);
    glColor3ub(0, 51, 102);
    glVertex2f(0, height);
    glColor3ub(144, 224, 239);
    glVertex2f(width, height);
    glColor3f(153, 204, 255);
    glVertex2f(width, 0);
    glEnd();
}

```

2. Brief instruction section

2.1 Building the model.

There are many codes in my project to build the models. I cut out some of them.

1)draw Functional Building

```

void FB()
{
    //draw the Functional Building
    glLineWidth(1.0);
    glColor3ub(152, 193, 217);
    glBegin(GL_POLYGON);
    glVertex2f(600, 200);
    glVertex2f(900, 200);
    glVertex2f(900, 500);
    glVertex2f(850, 500);
    glVertex2f(800, 450);
    glVertex2f(700, 450);
    glVertex2f(700, 555);
    glVertex2f(500, 555);
    glVertex2f(500, 450);
    glVertex2f(400, 450);
    glVertex2f(350, 500);
    glVertex2f(300, 500);
    glVertex2f(300, 200);
    glVertex2f(600, 200);
    glEnd();
}

```

2) draw the windows of FB

```
//draw windows
glColor3ub(224, 251, 252);
float x1 = 305;
float y1 = 395;
for (int i = 0; i <= 9; i++) {
    glRectf(x1, y1, x1 + 50, y1 + 50);
    x1 += 60;
}
x1 = 305;
y1 = 335;
```

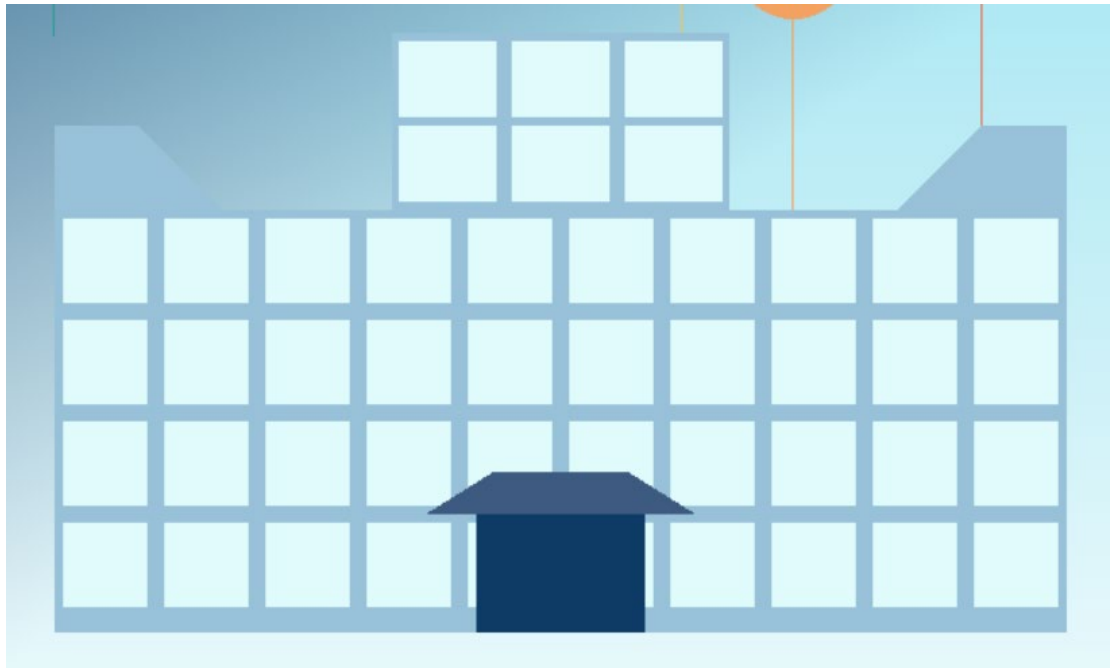
3) Draw tree

```
void Tree() {
    glBegin(GL_POLYGON);
    glColor3ub(26, 125, 6);
    glVertex2f(150, 190);
    glVertex2f(230, 190);
    glVertex2f(150, 270);
    glVertex2f(70, 190);
    glVertex2f(150, 190);
    glEnd();
    glBegin(GL_POLYGON);
    glColor3ub(119, 73, 54);
    glVertex2f(170, 190);
    glVertex2f(130, 190);
    glVertex2f(130, 100);
    glVertex2f(170, 100);
    glEnd();
}
```

2.2 Operating

In this part, I will provide a brief instruction section about how my program can be run effectively with screenshots.

1) Here is the screenshot of FB



You can use this keyboard to operate it. Like making it right movement or left movement.

```
void keyboard_input(unsigned char key, int x, int y) { // keyboard interaction
    if (key == 'q' || key == 'Q') // Exit
        exit(0);
    else if (key == 'r' || key == 'R') //right movement
        t += 10.0f;
    else if (key == 'l' || key == 'L') // left movement
        t -= 10.0f;
    else if (key == 'f' || key == 'F') //Front overturn
        r--;
    else if (key == 'b' || key == 'B') //Back overturn
        r++;
    else if (key == 'e' || key == 'E') //Enlarge
        s += 0.05f;
    else if (key == 's' || key == 'S') //Shrink
        s -= 0.05f;
}
```

And you can press eE or Ss to make it enlarge or shrink.

Here is the overview screenshot that you can see below

