

CPT205 – Assessment 1

A Invitation Card to 2024 XJTLU Graduation Ceremony

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1 Introduction

Here is a two-dimensional (2D) card of invitation to the 2024 XJTLU Graduation Ceremony. In this card, there are sky, land, a sun, clouds, flowers, trees, some balloons, Central Building, and invitation words with shining points. The overall rendering used to display the running status of the program can be seen in Figure 1.

2 Detail description of the card

All basic circles used in creating graphics use trigonometry (parametric representation of a circle).

2.1 Background: Sky and Land

The background is formed by concatenating two color gradient polygons. The big blue rectangle above, which changes from deep to light, represents the sky, while the remaining one below, which changes from green to pink, represents the land.

2.2 Sun

The sun is located to the right of the sky, which is the upper right of the entire curtain.

The main body of the sun is a yellow circle, and triangular rays are added as the orange light around the circle, which is obtained by translating and rotating triangles. When opening the card, the light starts to rotate counterclockwise continuously. On the yellow circle, a smiling face was drawn. Two eyes are black circles while the smiling mouth is drawn from a semicircle.

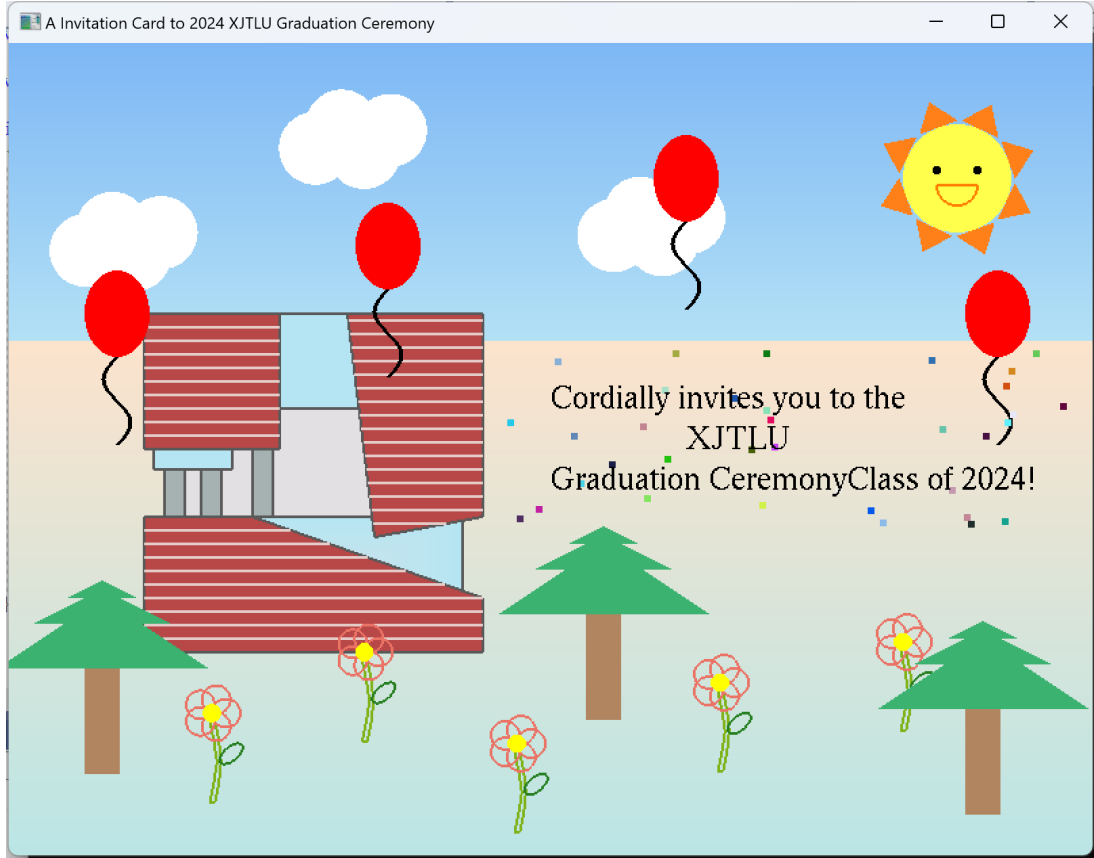


Figure 1: Overall rendering of the invitation card

2.3 Clouds

The 4 clouds are evenly distributed in the sky, which is the upper part of the entire curtain.

The white cloud is formed by splicing four circles. I beautify its shape by rotating and scaling, and I locate its position through the function parameters.

2.4 Flowers

The pink and green shapes below the land are 5 flowers.

The flower petals are composed of 5 pink circles spliced together, and the stamen is a small yellow circle. The curved stem is drawn with light green continuous lines, and the leaf, which is a dark green ellipse, is created by a polygon calculated in a circular pattern.

Flowers in the initial image are not filled with colors because I think only the lines are also beautiful. But they can also become filled with colors like Figure 2.

2.5 Trees

On the land, there is a tree approximately on the left, in the middle, and on the right.

Combination of a polygons and triangle create a tree shape (stump and canopy). A brown rectangular polygon is the stump of a tree and three green triangles of different

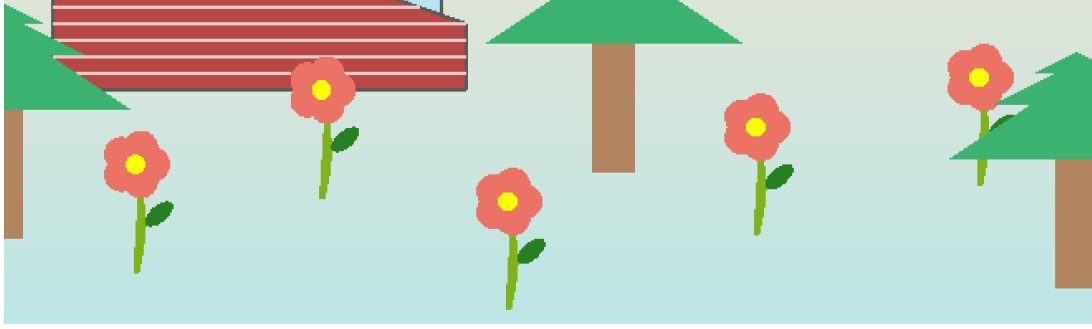


Figure 2: Filled flower

sizes form the canopy of a tree in descending order from bottom to top.

2.6 Balloons

There are four red balloons floating in the air.

Creating a balloon shape using a series of points calculated in a circular pattern, and drawing a sine curve as the balloon string.

In addition, I increased the line width to make the drawing of balloons more harmonious.

2.7 Central Building

The huge square shape on the left side of the card is Central Building. The combination of several polygons represents the east entry perspective of CB.

Firstly, I created some polygons to represent the structure of CB. For example, the blue areas on the top left and bottom right corners are the CB's glass windows. The three grey rectangles are pillars on the terrace. The brown-red polygons in the upper left corner, upper right corner, and below are the walls of CB. Secondly, I draw dark gray lines to display the outline of CB. Finally, I used a line algorithm to draw horizontal lines with the same horizontal distance within specific polygonal regions to decorate the brownish-red walls.

2.8 Invitation Words

It is located to the right in the middle of the curtain. The color is set to black. Moreover, I use a specified font to render text on the screen and I draw multiple lines to present the best visual effect.

2.9 Shining Points

I drew small colored points at specific positions on the screen to highlight Invitation Words.

Through updating the lifetime of the points, deleting the point with a lifetime of 0, adding new points, and controlling their existence time, the points can blink.

3 Interactive Instruction

Users can modify various parameters using keyboard and mouse inputs. This article below will guide you through the interactive instructions, explaining how to effectively interact with the program.

3.1 Keyboard interaction

3.1.1 Quit the Program

Press ‘**Q**’ or ‘**q**’ to exit the program and close the window. This key serves as an emergency exit, enabling users to terminate the application whenever needed.

3.1.2 Adjust Balloons Position

Move four balloons to the **right** by 20 units: Press ‘**T**’ or ‘**t**’.

Move four balloons to the **left** by 20 units: Press ‘**B**’ or ‘**b**’.

Move four balloons **up** by 20 units: Press ‘**I**’ or ‘**i**’.

Move four balloons ‘**down**’ by 20 units: Press ‘**D**’ or ‘**d**’.

3.1.3 Toggle Drawing Modes of Flowers

Press ‘**F**’ or ‘**f**’ to toggle between drawing polygons in the ‘line’ and ‘fill’ modes of flowers. This feature allows users to switch between different visualization styles.

3.2 Mouse Interaction

3.2.1 Modify the Speed of Sun

The sun initially rotates counterclockwise at a speed of 1 unit. The fastest speed is 15 units.

Left Mouse Button:

Click the left mouse button to decrease the speed of the sun’s counterclockwise rotation by 1 unit. Once the sun stops rotating (i.e. the speed decreases to 0), clicking the left button again will cause the sun to rotate in the clockwise direction.

The fastest counterclockwise rotation speed is 15 units. When the speed reaches 15 units, no matter how you click the left button, there will be no further changes.

For example, you click the left button once at the beginning, and the sun will stop rotating. After that, you still click left button, and the sun will rotate in the opposite direction (i.e. clockwise direction).

Right Mouse Button:

Click the right mouse button to increase the speed of the sun’s counterclockwise rotation by 1 unit. Once the sun stops rotating (i.e. the speed decreases to 0), clicking the right button again will cause the sun to rotate in the counterclockwise direction.

The fastest clockwise rotation speed is 15 units. When the speed reaches 15 units, no matter how you click the right button, there will be no further changes.

For example, you click the right button once at the beginning, and the sun will increase its rotation speed by 1 unit. Afterward, you can still right-click 13 or more times (reach 15 units), and then right-click again, and the sun will no longer have any changes.

3.2.2 Adjust the Position of Balloons with Mouse Wheel

This is another interaction that changes the position of the balloon. This action allows users to move balloons up or down incrementally.

Scroll Up: Scroll the mouse wheel up to move four balloons **up** by 20 units. This action allows users to move balloons up incrementally.

Scroll Down: Scroll the mouse wheel down to move balloons **down** by 20 units.