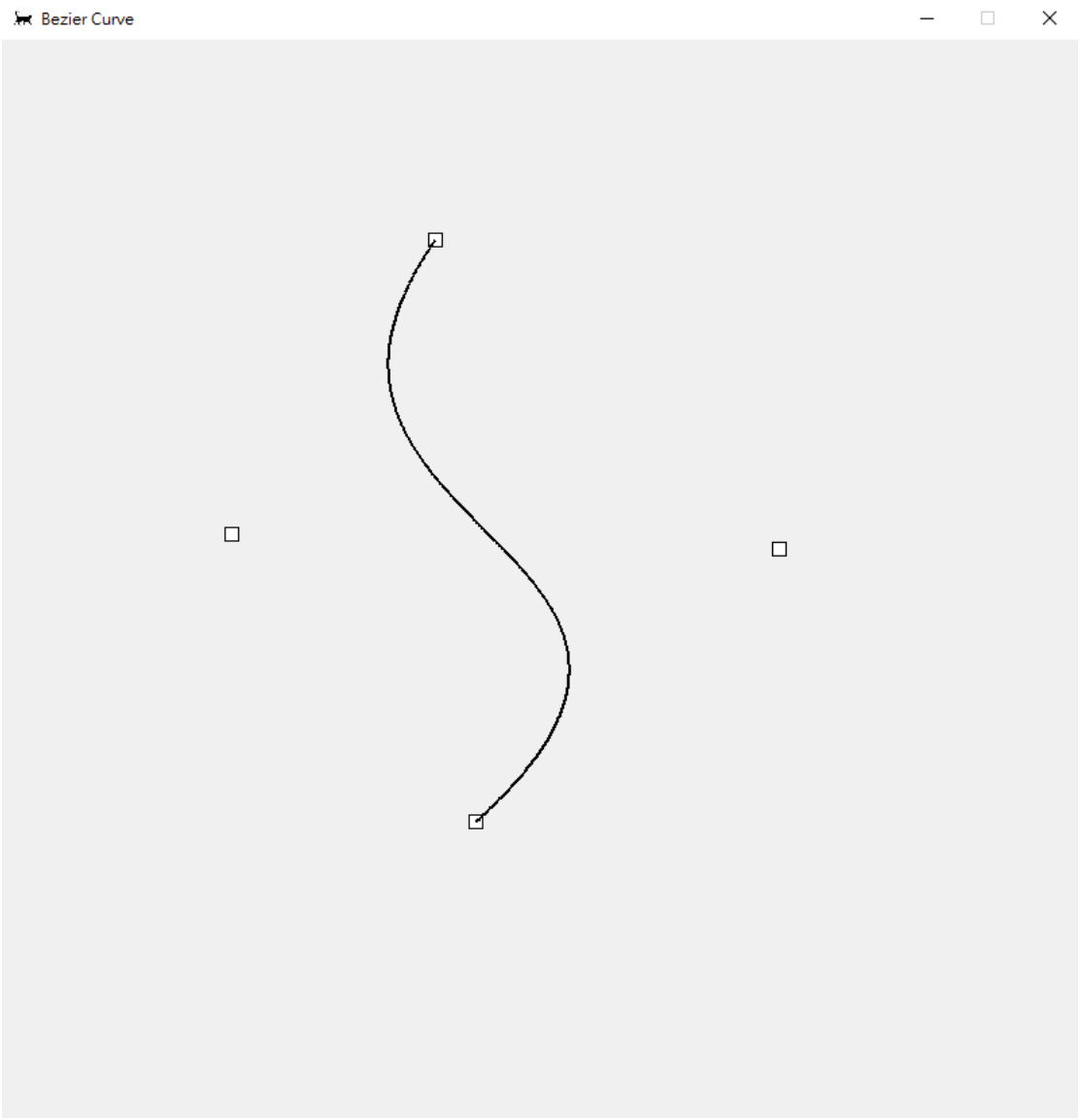
Multimedia Information Systems

Homework

(Due at 23:55 on November 6 /2023)

Part 1：Bézier Curve



Score (7 pts):

1. Draw four arbitrary points. (1 point)
2. Write a recursive approach as described in the class by yourself.
   That is, you can't call **existing library functions** to draw the Bézier curve directly. (3 points)
3. Then, draw a Bézier Curve according to the given four points. (1 point)
4. Update the corresponding Bézier Curve when you move any one of the four points and ensure move them at any time. It means that no limits to moving times. (2 points)

Part 2：DreamCatcher

Score (10 pts):

Please follow the guidelines to draw a pattern like a dreamcatcher. In the process, some approach or function you must use **recursive approaches** to get to a result.

Notice:

- ✓ Please name your function or approach by the rule 'RC_approach'. (ex: RC_A)
- ✓ Annotate when you coding as much as possible. (Either in Chinese or English)
- ✓ The points will not be deducted because of calculation errors.
- ✓ If you use the **brute force approach** for solving problems, the full mark of any approach will **be 0 points**.
- ✓ To better understand the topic, we suggest you read the RC_C recursive approach first, then read A and B.

Question:

1. The number of levels should be from 1 to 8. Create buttons that you can increase or decrease the recursive level and display the current level. (1 point)

- RC_A: Design a recursive approach for a dendrite. It's used to grow new branch.

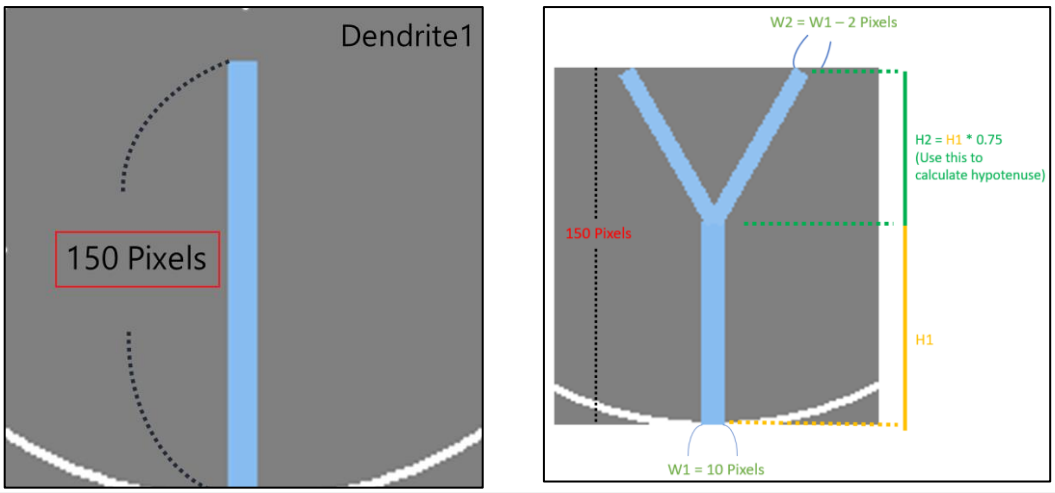
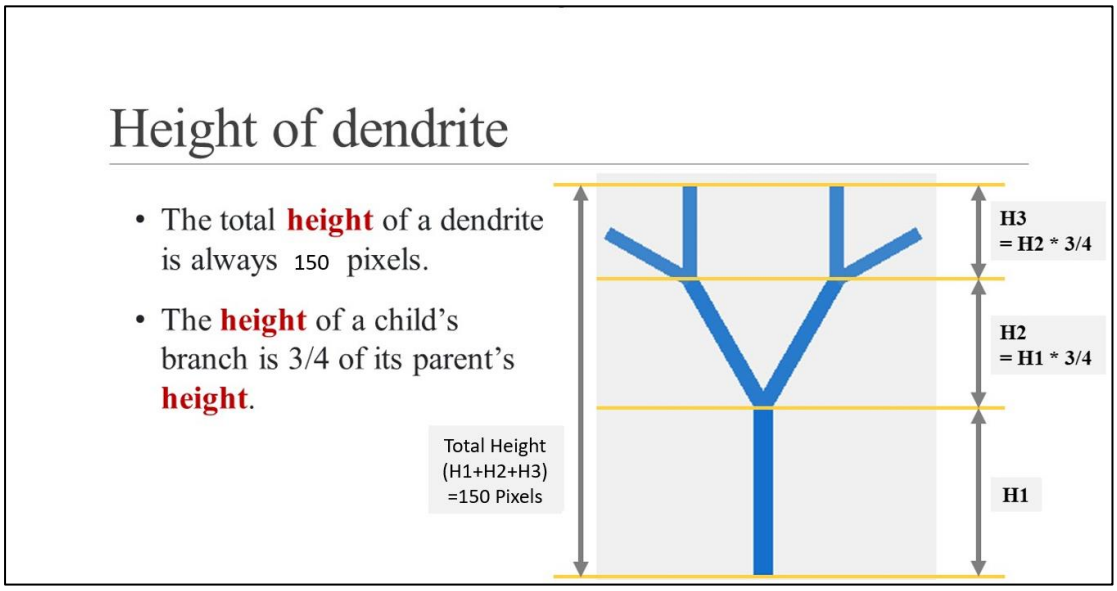


Figure 1 : dendrite



1. The total height of a dendrite is always **150 pixels**. The height of a child's branch is 0.75 times of its parent's height, as shown in **Figure 1**.
   (Hint: Not the **branch length**!).
   The dendrite must **stop growing** when the number of levels is **greater than 6**. (1 point)
2. The width of the first branch is **10 pixels**.
   The width of a child branch is 2 pixels less than its parent's width, as shown in Figure 1. (1 point)
3. The angle between branches should be 30 degrees to the left and 30 degrees to the right, as shown in Figure 1.
   However, compared to the dendrite's degree if the new branch degrees are smaller than -90 degrees or bigger than +90 degrees, **don't show it**, as shown in Figure 2. (1 point)

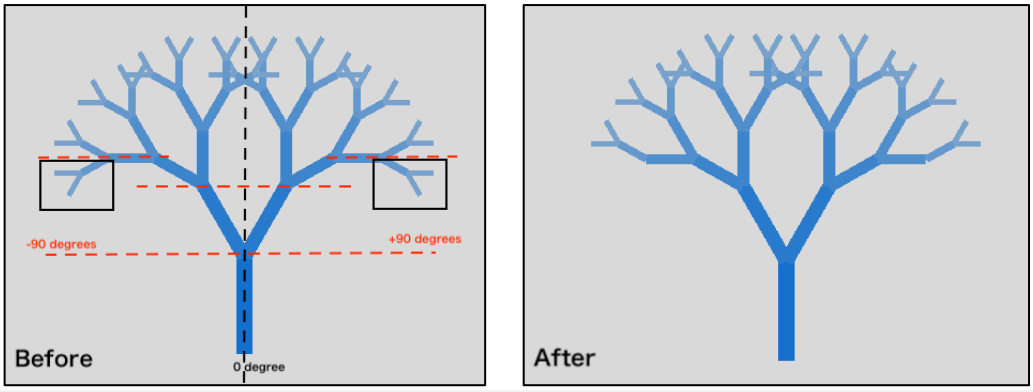


Figure 2 : pruning

- RC_B_1: Design 3 feather. (1 point)

1. The length of feather is 225 pixels, as shown in Figure 3.
2. The branches start growing from a distance of **67.5(30% of the total length)** pixels from the circle and **the leaf** should grow in the direction of **60 degrees**, as shown in Figure 3.
3. Three feathers should respectively grow at angles of 225, 270, and 315 degrees around the circle, as shown in Figure 3.
4. The color of feather is RGB(145,168,208) / #91A8D0.

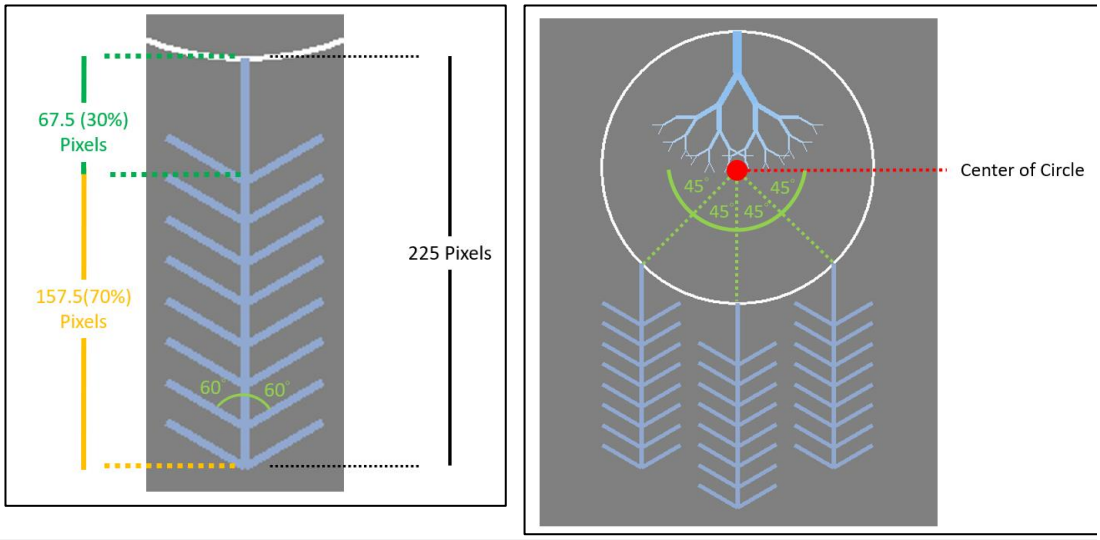


Figure 3 : Feather

- RC_B_2: Design recursive approach for fractal flower. (1 point)

1. When the **level is 7**, the fractal flower will bloom. Only one flower should grow on two-thirds(2/3) of the leaves from RC_B_1,as shown in Figure 4-2. (Hint: Divide the leaves into three equal parts)

The flower is constructed by circles. The initial flower is one circle of **14 pixels** in diameter. The child flower's diameter would **be half (1/2) less** than the parent flower's diameter, as shown in Figure 4-1. The initial width is **3 pixels**. The child flower's width is the parent flower's width **minus 2**, as shown in Figure 4-1.

2. The color of circle is RGB(247,202,201) / #F7CAC9

- RC_B_3: Design recursive approach for fractal petal.

1. The next level flower has 6 petals (circle), which means you should make it bloom from **6 different directions,** and the difference between the two neighboring directions is 60 degrees, as shown in Figure 4(right). (1 points)

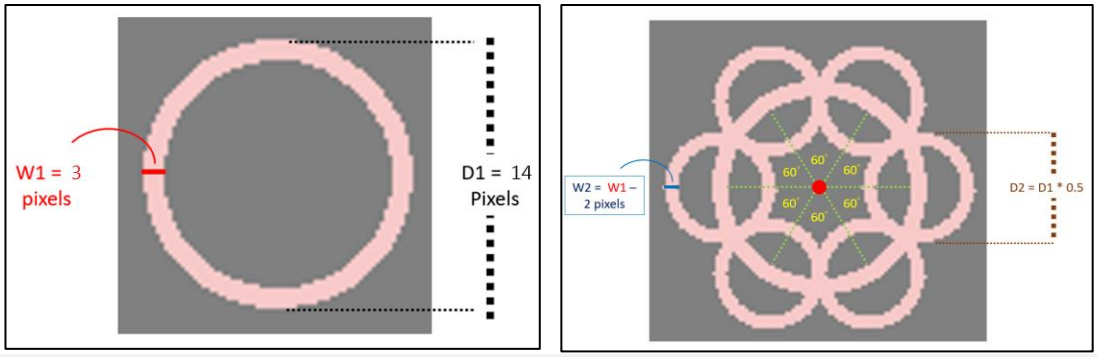


Figure 4-1: flower

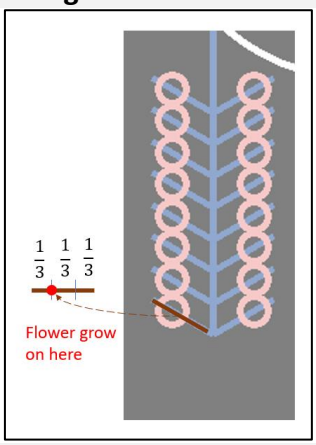


Figure 4-2: Flower place

- RC_C: Design a fractal dendrite.

1. Draw the circle to be the frame of dreamcatcher. The **diameter** of circle is always 300 pixels. The width of circle is always 3 pixels. (1 point)

2. Write a loop to make the dendrite spread. The angles between the dendrites must **be equal**. The dendrite must stop spreading when the number of levels is greater than 6. The number of dendrites follows the Fibonacci **(Notice: You can't call existing library functions, please write the recursive function by yourself**). For example, if you in level 1, you should have 2 dendrites, and in level 3, you should have 5 dendrites. (1 point)

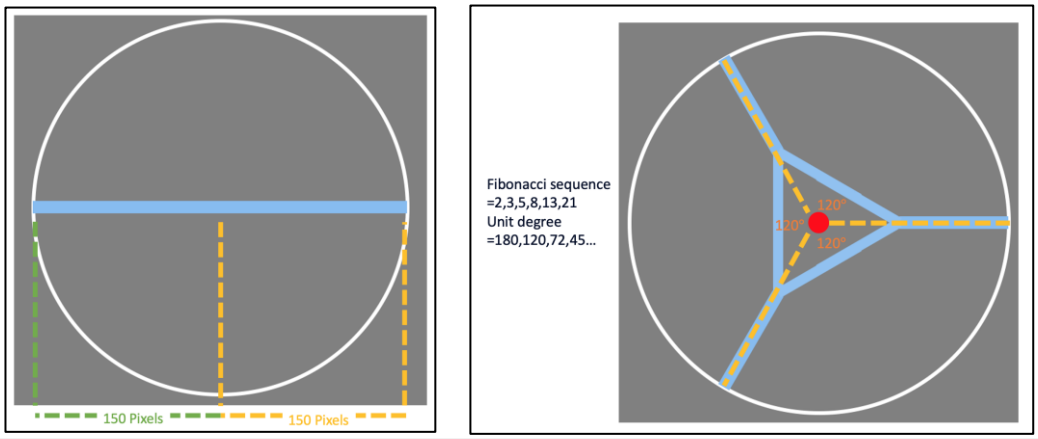


Figure 5 : Spread

3. Set the branch gradient color according to the layers of branches and set the flower's color. (1 point)

- ✓ The first layer of branches' color is **RGB(135, 188, 240) / #87BCF0**
- ✓ The next layer of branches' color increases the **R-value by 10** and increases the **G value by 5** from the previous layer of their color. B always remains unchanged.

Part 3：Final Project & Team Member List

Score (3pts):

1. Team member list should include the following information: (1 point)

- ✓ Student ID.
- ✓ Class (Univ., College/School, and Department)
- ✓ Name
- ✓ Email
- ✓ your topic of the final project.

2. Briefly describe your final project and you also need to include your purpose, input, and output (less than 500 words). (2points)

Notice

1. You need to attach the executable file, source codes and a doc file that shows how to compile/use your program for parts 1 and 2 (which may include the involved operating system, software, environment variables, and so on).
2. Create another doc file for your part 3.
3. Create a folder that contains your files, name the folder with your Student ID. (For example: M11009806_yourname), and then compress it into a ZIP or RAR. Upload it to Moodle before 23:55 on November 14 /2022

Thank you for your cooperation!