一、作業環境:

Windows 11 / VS Code 1.83.1 / Python3.12

二、方法說明:

根據論文中的算式，實作出以下的演算法

For each pixel X in the destination
    $DSUM = (0,0)$
    $weightsum = 0$
    For each line $P_i Q_i$
        calculate u,v based on $P_i Q_i$
        calculate X'_i based on u,v and $P_i'Q_i'$
        calculate displacement $D_i = X_i' - X_i$ for this line
        $dist$ = shortest distance from X to $P_i Q_i$
        $weight = (length^p / (a + dist))^b$
        $DSUM \mathrel{+}= D_i * weight$
        $weightsum \mathrel{+}= weight$
    $X' = X + DSUM / weightsum$
    destinationImage(X) = sourceImage(X')

$$u = \frac{(X-P)\cdot(Q-P)}{\|Q-P\|^2} \quad (1)$$

$$v = \frac{(X-P)\cdot Perpendicular(Q-P)}{\|Q-P\|} \quad (2)$$

$$X' = P' + u\cdot(Q'-P') + \frac{v\cdot Perpendicular(Q'-P')}{\|Q'-P'\|} \quad (3)$$

$$weight = \left(\frac{length^p}{(a+dist)}\right)^b \quad (4)$$

其中，將公式 (2) 的分母改成 $||Q-P||^2$ ；公式 (3) 將第三項的分母 $||Q'-P'||$ 改成 1。

三、程式如何執行:

- 在 terminal 輸入指令 `py hw2.py` 或直接點選執行
- 決定是否由使用者於 ui 上畫 feature lines
- 選擇功能，並輸入指定的 alpha 值

```
0. Exit
1. Default output
2. Draw A->B animation
3. Draw A->B->C animation
4. Play A->B animation
5. Play A->B->C animation
6. Three images morphing
Choose?
```