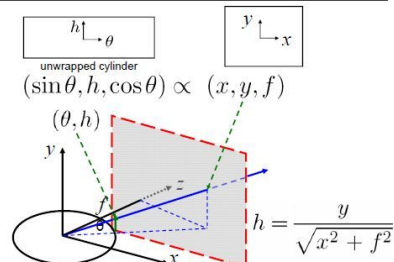


VFX Project 2: Image Stitching

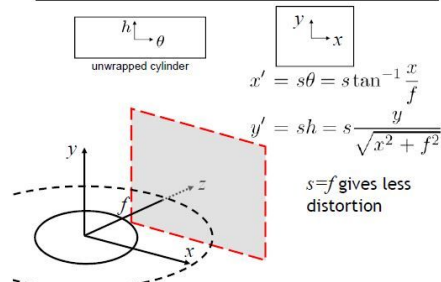
R07944050 賴以尊

1. Warp images to cylinder

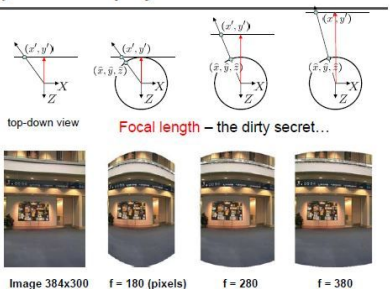
Cylindrical projection



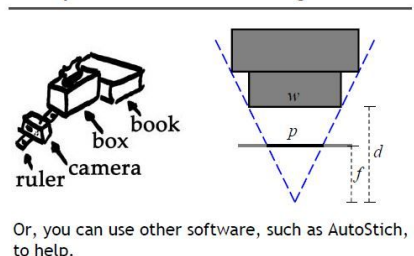
Cylindrical projection



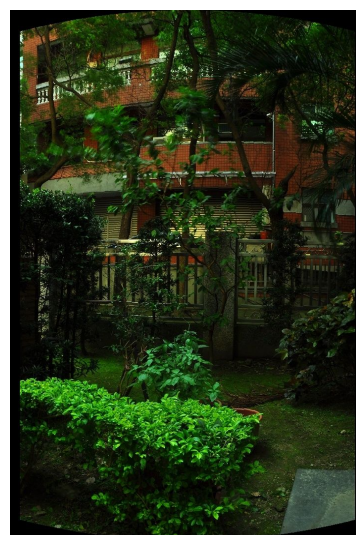
Cylindrical reprojection



A simple method for estimating f



1. 以圖片中心為原點，從-height/2到 height/2， -width/2到 width/2之間利用投影片右上角給的公式算投影
2. 因為步驟是把公式實現，所以這部分的function和原本那份code基本是一樣的

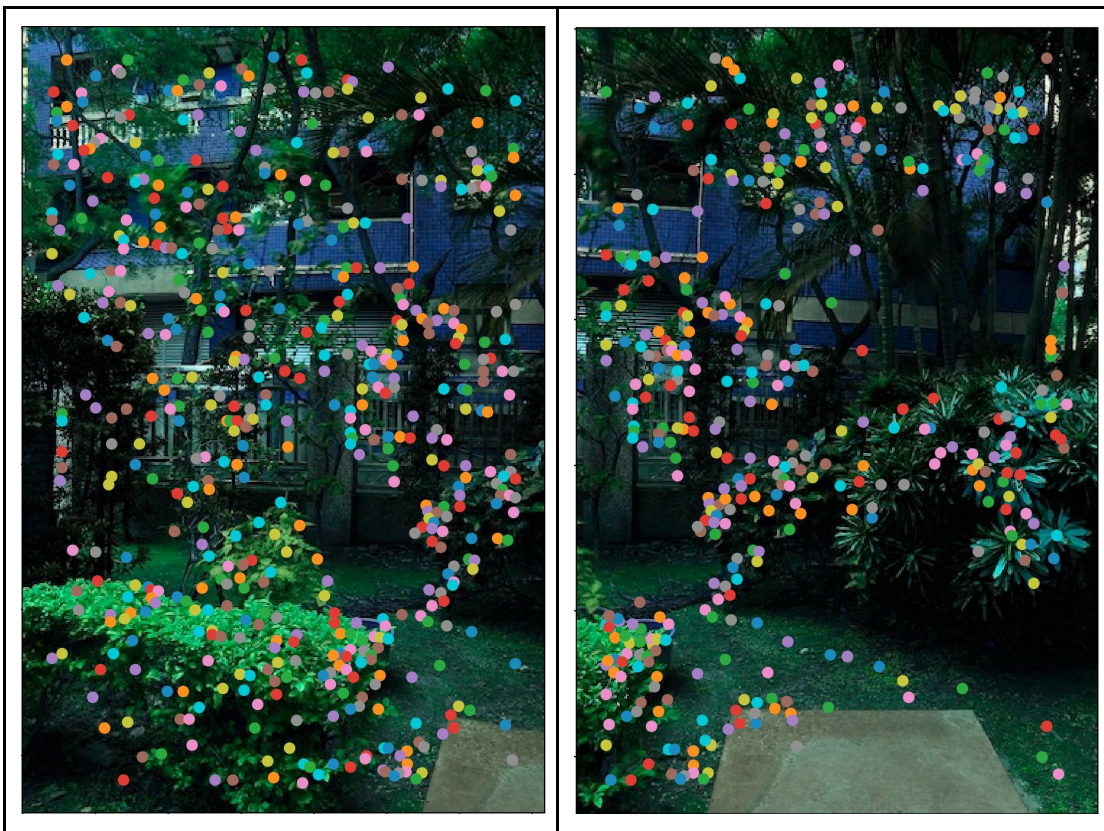


2. Feature detection

a. 參考 Harris corner detector

b. Threshold為5, 找到local maximum後再做NMS

Summary of Harris detector DigiVFX	Summary of Harris detector DigiVFX
<p>1. Compute x and y derivatives of image</p> $I_x = G_x^* I \quad I_y = G_y^* I$ <p>2. Compute products of derivatives at every pixel</p> $I_{x^2} = I_x \cdot I_x \quad I_{y^2} = I_y \cdot I_y \quad I_{xy} = I_x \cdot I_y$ <p>3. Compute the sums of the products of derivatives at each pixel</p> $S_{x^2} = G_{\sigma^2} * I_{x^2} \quad S_{y^2} = G_{\sigma^2} * I_{y^2} \quad S_{xy} = G_{\sigma^2} * I_{xy}$	<p>4. Define the matrix at each pixel</p> $M(x, y) = \begin{bmatrix} S_{x^2}(x, y) & S_{xy}(x, y) \\ S_{xy}(x, y) & S_{y^2}(x, y) \end{bmatrix}$ <p>5. Compute the response of the detector at each pixel</p> $R = \det M - k(\text{trace} M)^2$ <p>6. Threshold on value of R; compute nonmax suppression.</p>



3. Feature description

1	2	3
4	5	6
7	8	9

$$\left(\begin{array}{ccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \end{array} \right)$$

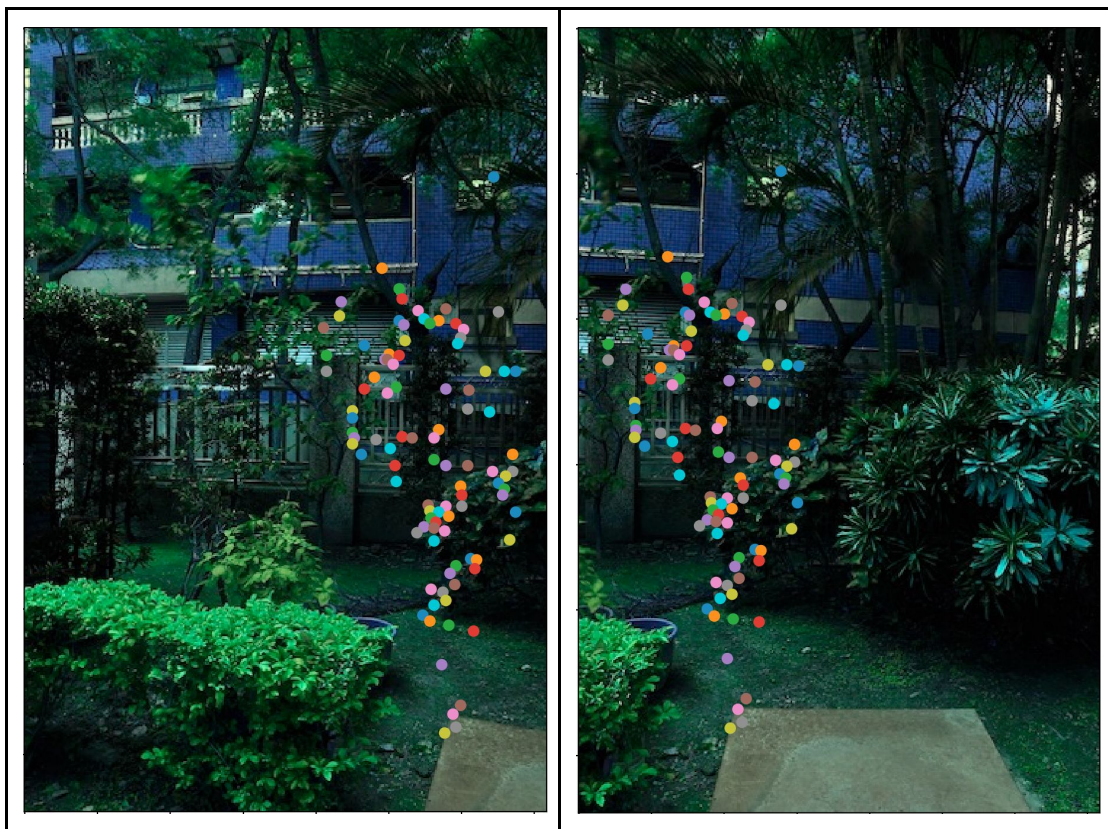
利用長度為100的向量表示10*10window下feature point的neighbor

4. Feature matching

1. 對兩張圖的feature points算euclidean distance
2. 如果距離最小值 < 次小值*0.8視為match

5. Use RANSAC to find best warp model

1. 使用RANSAC
2. 每個iteration隨機選擇適合的translation model再將圖片套用此model
3. 計算其他points用此位移model的誤差，error < 10的視為inliner，加總inliner error找出最適合的model



6. Stitch image

利用前一步驟算出的 translation去貼合兩兩圖片成一張
再將所有圖片接合，最後可再用修圖軟體去把弧線部分剪掉

7. Result



8. 心得:

重新做一遍後的結果看起來比較差，但其實feature都有match到，
只是在stitching時候不知道有甚麼問題導致沒有對齊得很好

9. Note

1. 執行環境: windows 10 + visual studio code
2. 執行指令: `python feaDetect.py <inputdirname>`
 1. inputdir內有一image_list.txt紀錄圖片檔名和個別的焦距
 2. output存在Result資料夾
 3. 以這份的預設資料夾來說:
`python feaDetect.py input_image`

11. Reference

1. Szeliski and Shum's SIGGRAPH 1997 paper
2. 課程講義