基於電腦視覺之藥品定位系統

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Introduction

- 藥品數量偵測
  - 採用yolo-v7 model來進行數量偵測
- 為了提高模型判斷藥品數量準確度、提供藥品定位資訊
- => 加入圖片位置校正功能
  - 將不同角度(側拍)的照片校正成俯拍的視角
- => 判斷藥品擺放位置、模型偵測是否正確

圖片校正

- Input : 兩張image (一張側拍的視角，一張俯拍的視角)
- Target : 想辦法將側拍視角的圖推成俯拍視角的圖

圖片校正

- Research Method :
  - 使用SIFT feature detector找到關鍵點
  - 接著使用FLANN匹配器進行特徵點匹配
  - 為了確保匹配準確性，所以還需要進行比率測試
  - 然後，再使用cv2.findHomography/cv2.estimateAffine2D進行變換估算
  - 最後，使用Affine/Perspective來進行變換

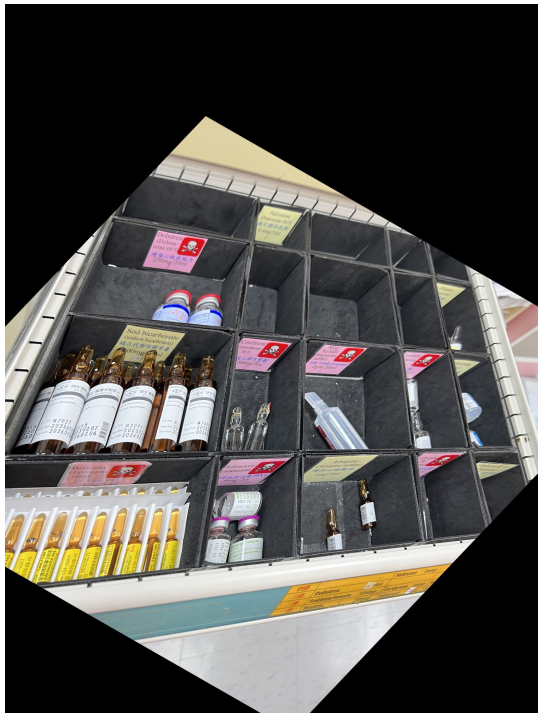
圖片校正

- Experimental results

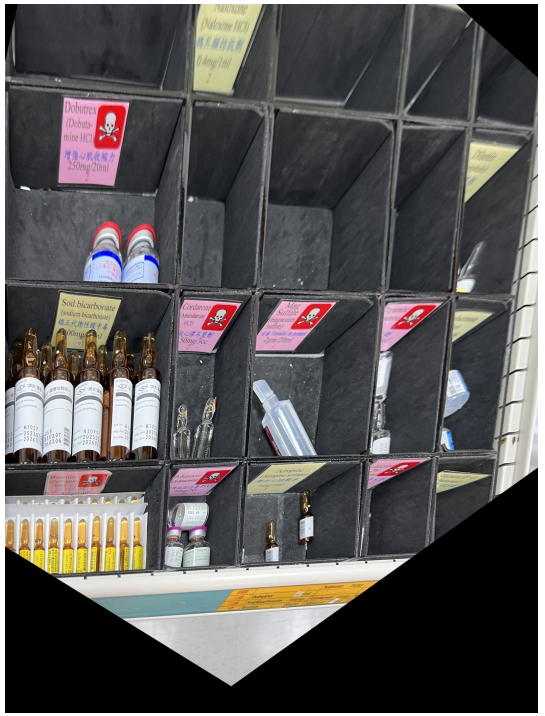
側拍

俯拍

Affine變換後結果



Perspective變換後結果



圖片校正

- Experimental results

```
(base) sunyujun@sunyujundeMacBook-Pro CV_FinalProj-main % python project.py IMG_7673.JPG
```

None	00/02	None	None	None
02/02	None	None	None	01/04
02/05	02/02	01/01	00/05	01/04
08/20	00/03	02/03	00/02	00/04

側拍圖：average accuracy = 59.835%

None accuracy: 100%	00/02 accuracy: 0%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%
02/02 accuracy: 100%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%	01/04 accuracy: 25%
02/05 accuracy: 40%	02/02 accuracy: 100%	01/01 accuracy: 100%	00/05 accuracy: 0%	01/04 accuracy: 25%
08/20 accuracy: 40%	00/03 accuracy: 0%	02/03 accuracy: 66.7%	00/02 accuracy: 0%	00/04 accuracy: 0%

圖片校正

- Experimental results

```
(base) sunyujun@sunyujundeMacBook-Pro CV_FinalProj-main % python project.py IMG_7671.JPG
 ________ ________ ________ ________ ________
|  None  | 02/02  |  None  |  None  |  None  |
|________|________|________|________|________|
| 02/02  |  None  |  None  |  None  | 03/04  |
|________|________|________|________|________|
| 05/05  | 02/02  | 01/01  | 05/05  | 04/04  |
|________|________|________|________|________|
| 14/20  | 00/03  | 04/03  | 04/02  | 02/04  |
|________|________|________|________|________|
```

俯拍圖：average accuracy = 86%

None accuracy: 100%	02/02 accuracy: 100%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%
02/02 accuracy: 100%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%	03/04 accuracy: 75%
05/05 accuracy: 100%	02/02 accuracy: 100%	01/01 accuracy: 100%	05/05 accuracy: 100%	04/04 accuracy: 100%
14/20 accuracy: 70%	00/03 accuracy: 0%	04/03 accuracy: 75%	04/02 accuracy: 50%	02/04 accuracy: 50%

圖片校正

- Experimental results

```
(base) sunyujun@sunyujundeMacBook-Pro CV_FinalProj-main % python project.py warpPerspective.jpg
```

None	01/02	None	None	None
02/02	None	None	None	00/04
05/05	02/02	01/01	01/05	02/04
07/20	01/03	02/03	02/02	00/04

將側拍圖進行Perspective校正後結果：average accuracy = 72.75%

None accuracy: 100%	01/02 accuracy: 50%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%
02/02 accuracy: 100%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%	00/04 accuracy: 0%
05/05 accuracy: 100%	02/02 accuracy: 100%	01/01 accuracy: 100%	01/05 accuracy: 20%	02/04 accuracy: 50%
07/20 accuracy: 35%	01/03 accuracy: 33.3%	02/03 accuracy: 66.7%	02/02 accuracy: 100%	00/04 accuracy: 0%

圖片校正

- Experimental results

```
(base) sunyujun@sunyujundeMacBook-Pro CV_FinalProj-main % python project.py warpAffine.jpg
```

None	00/02	None	None	None
02/02	None	None	None	01/04
05/05	02/02	01/01	03/05	02/04
08/20	01/03	02/03	01/02	02/04

將側拍圖進行Affine校正後結果：average accuracy = 73.75%

None accuracy: 100%	00/02 accuracy: 0%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%
02/02 accuracy: 100%	None accuracy: 100%	None accuracy: 100%	None accuracy: 100%	01/04 accuracy: 25%
05/05 accuracy: 100%	02/02 accuracy: 100%	01/01 accuracy: 100%	03/05 accuracy: 60%	02/04 accuracy: 50%
08/20 accuracy: 40%	01/03 accuracy: 33.3%	02/03 accuracy: 66.7%	01/02 accuracy: 50%	02/04 accuracy: 50%

圖片校正

- Experimental results
  - Conclusion : 經過圖片校正後能提高yolo-v7 model偵測藥品數量準確率

側拍圖	俯拍圖	Perspective校正	Affine校正
average accuracy 59.835%	average accuracy 86%	average accuracy 72.75%	average accuracy 73.75%

藥品定位、模型偵測錯誤

- 判斷yolo v7模型是否有偵測藥品種類的錯誤
- 判斷藥品是否擺錯位置

藥品定位、藥品種類偵測錯誤

- Research Method :
  - 採用兩階段來判斷錯誤：
  - 第一階段：使用相對距離來判斷是否有藥品位置擺放錯誤
    - 與同一種藥品偵測分數最高的當基準點
    - 當相對距離 `>= threshold :` 就是有錯誤的部分
  - 第二階段：使用藥品數量來判斷是否有多偵測的情況
    - 把同一種藥品偵測分數最低的當偵測錯誤的部分

藥品定位、藥品種類偵測錯誤

- Experimental results

原model偵測出來的

偵測出藥品放錯的地方

```
(base) sunyujun@sunyujundeMacBook-Pro CV_
藥品位置放錯或模型偵測種類錯誤的數據：
('med6 0.889', 1170, 2085, 1741, 2458)
('med16 0.532', 317, 1808, 793, 1926)
('med16 0.652', 295, 1917, 775, 2030)
('med18 0.655', 368, 1163, 813, 1462)
('med19 0.583', 197, 1250, 650, 1560)
('med19 0.774', 355, 1163, 820, 1463)
('med13 0.895', 1070, 2092, 1774, 2472)
```

(藥品名, x0, y0, x1, y1)

Thanks for your listening