

Vehicular Vision System

Final Presentation

即時人物追蹤

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2020.01.10

OUTLINE

- ❖ What we done
- ❖ Methodology
- ❖ Results
- ❖ Q&A

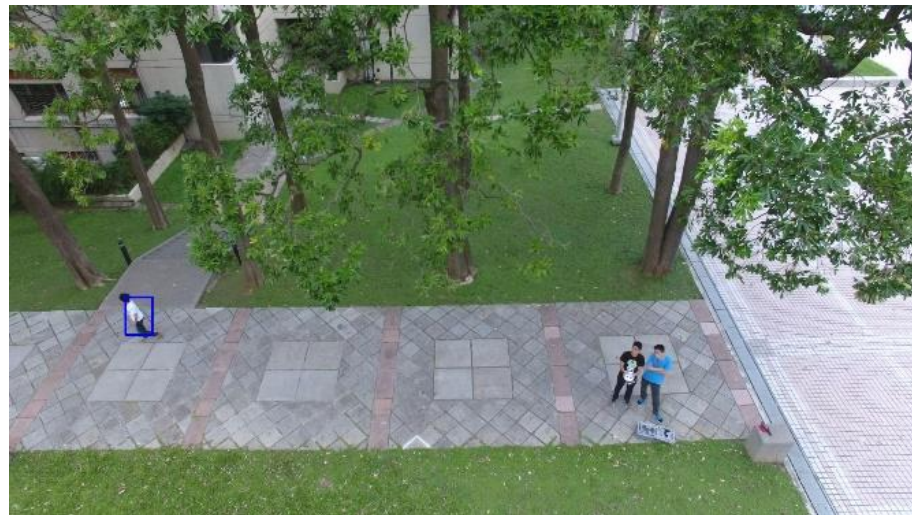
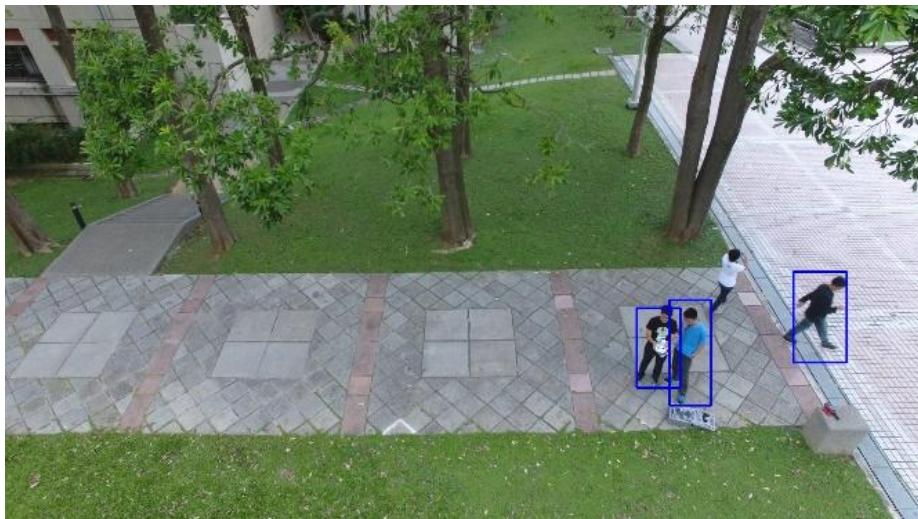
What we done

➤ 即時人物追蹤

- Object Detection - YOLO v3
- Object Tracking - SORT
- Tello Control - Tello API

無人機飛行高度問題

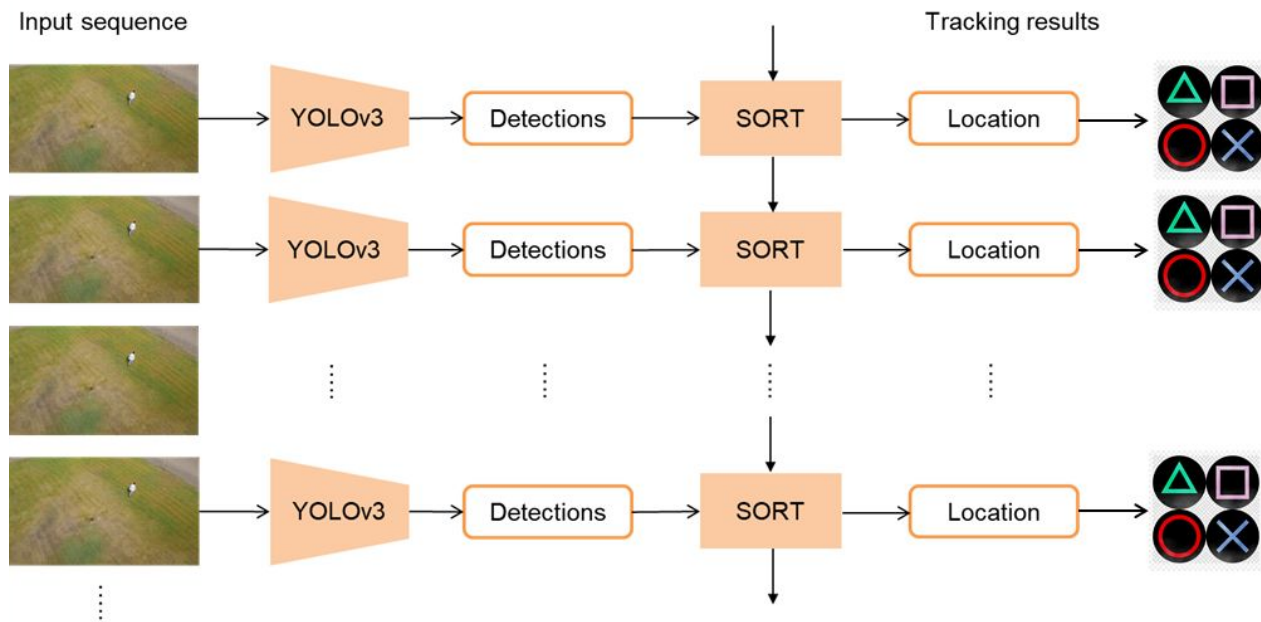
- 本來想建立空拍影像集 -> 訓練進行高空物件偵測
- 但是發現Tello在上升至2公尺後會開始不穩定, 所以高度設為1.8公尺



Methodology (Detection)

➤ YOLOv3偵測(只針對人) + SORT追蹤(Simple Online and Realtime Tracking)

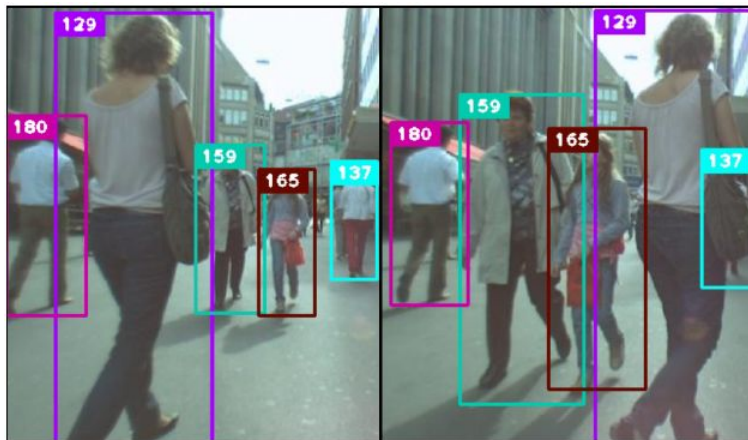
- 行人運動估計
- 多目標追蹤
- 追蹤身分建立與刪除



追蹤方法架構圖

Methodology (Control)

- 優點:
 - a. 人物消失一段時間後再出現還是能繼續追蹤主人
 - b. 畫面出現多人時還是會追蹤主人
- Tello影像輸出大小為960x720 (4:3)
- 依照YOLOv3框出的BoundingBox位置進行無人機前後左右移動控制

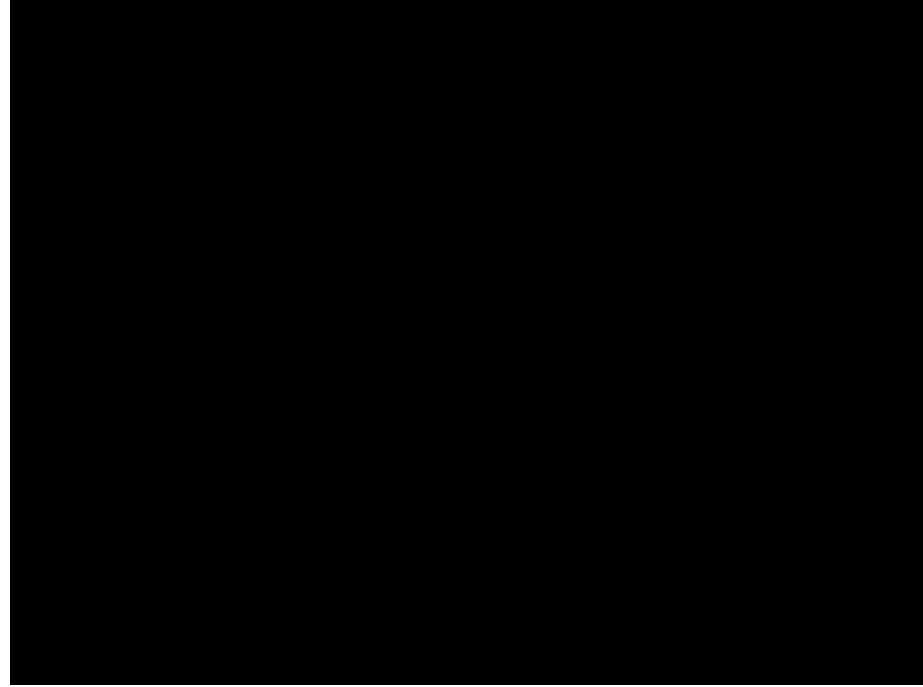
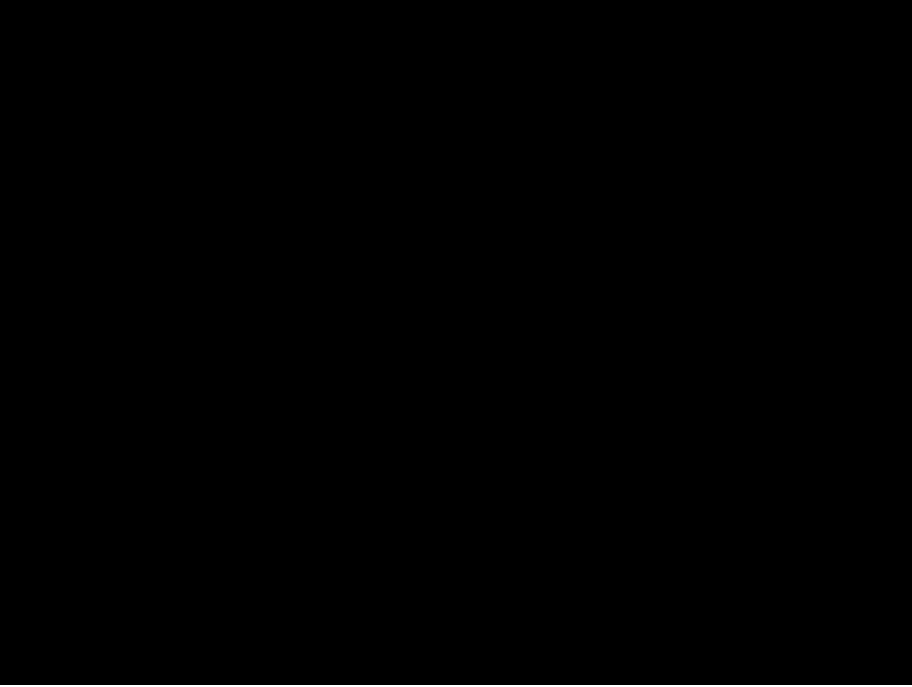


Control Example

- 前進 (當BBox的Height 小於500時 前進60公分)
- 後退 (當BBox的Height 大於600時 後退60公分)
- 左右轉 (將畫面寬度切成五等分, 每次旋轉15度)



Results (Video Demo)



Q&A

**THANKS FOR
YOUR
ATTENTION**

Control Example

- 前進 (當BBox的Height 小於500時 前進60公分)

960



Control Example

- 後退 (當BBox的Height 大於600時 後退60公分)

960



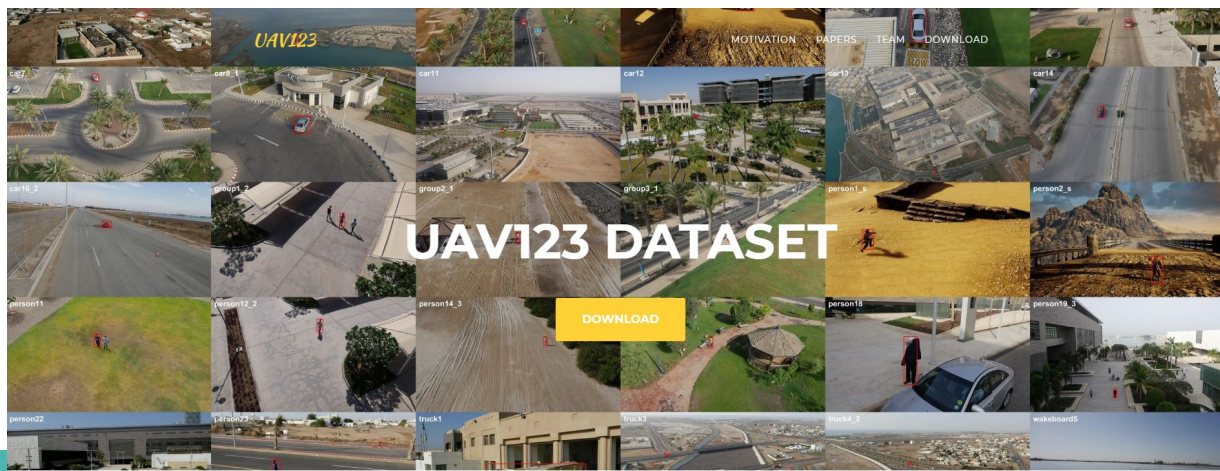
Control Example

- 左右轉 (將畫面切成五等分, 每次旋轉15度)



Experiment

- Environment
 - CPU: Intel i7- 6700
 - GPU: NVIDIA TITAN Xp
 - RAM: 16G
 - OS: Ubuntu 16.04
- Dataset (UAV123)
 - Unmanned Aerial Vehicle
 - Total 123 videos
 - Target: people, car, ship ...

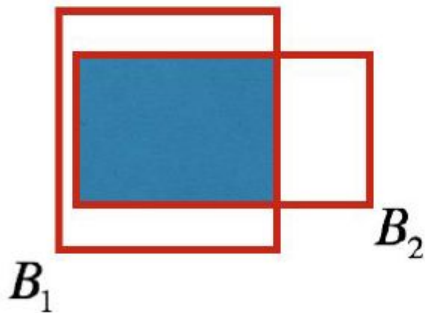


Evaluation

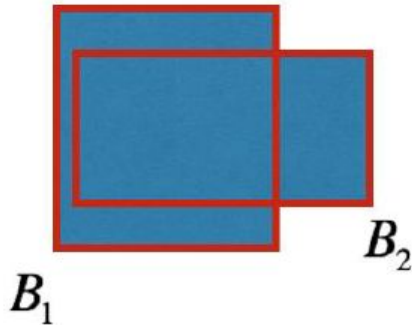
- Average Overlap Score(AOS) 所有幀的平均重疊率

$$\text{AOS} = \frac{1}{N} \sum_{k=1}^N \text{IoU}(bb_{tr}^k, bb_{gt}^k)$$

Intersection



Union



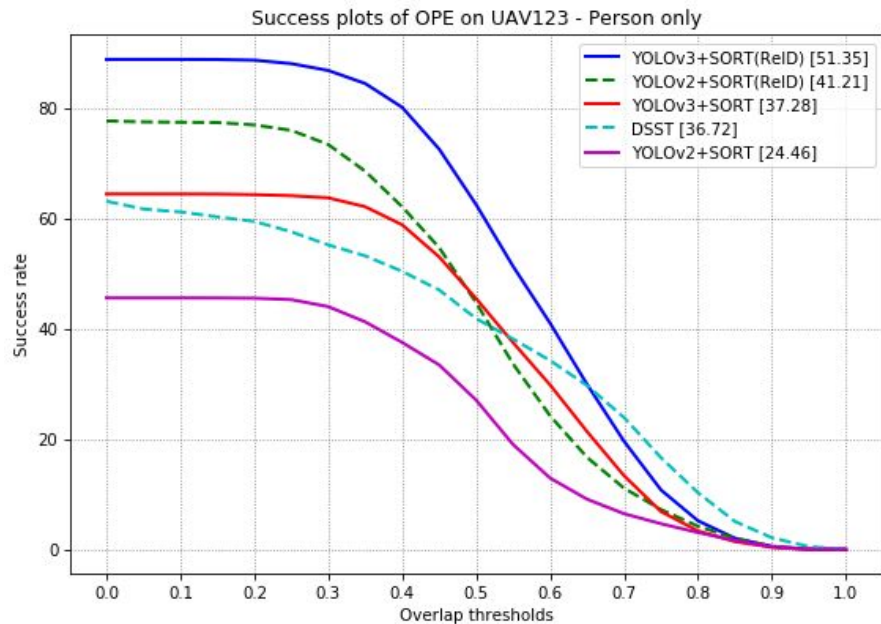
Intersection over Union

$$\text{IoU} = \frac{B_1 \cap B_2}{B_1 \cup B_2} = \frac{\text{Intersection}}{\text{Union}}$$

The diagram shows the intersection of two rectangles (shaded blue) divided by the union of the two rectangles (shaded blue). The rectangles are outlined in red.

Results (Comparison)

➤ YOLOv2 V.S. YOLOv3 -> 偵測對追蹤有大影響



UAV123 人物追蹤圖表

	Tracker/Detector Name	Speed (fps)
Tracker	DSST	35.3
	YOLOv3+SORT	28.6
	YOLOv3+SORT(ReID)	27.4
	YOLOv2+SORT	35.4
	YOLOv2+SORT(ReID)	34.7
Detector	YOLOv3	29.1
	YOLOv2	36.5

執行速度比較