COMP9517 Group Project Stage One
Object Detection and Tracking

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This demo is an arrangement of the incoming group project to get familiar with common detection and tacking APIs of Open CV. This program could detect objects showed at the beginning of a video and continues to track them in the following frames of this video. Automatically detected objects would be classified by colours of their contours. All the matches like key points and matching lines would be coloured as well.

Utilization of Open CV and other python APIs

1. Open CV Video APIs Utilized

```
cv2.VideoCapture  video.read
```

2. Open CV Contour Detection Algorithms Utilized

```
cv2.findContours            cv2.bilateralFilter   cv2.GaussianBlur
cv2.getStructuringElement   cv2.Canny             cv2.morphologyEx
cv2.cvtColor                cv2.dilate            cv2.erode
cv2.threshold               cv2.getStructuringElement
```

3. Open CV Image Key Points Detection APIs (SURF) Utilized:

```
cv2.xfeatures2d.SURF_create     surf.detectAndCompute
```

4. Open CV Matching APIs Utilized

```
cv2.FlannBasedMatcher      flann.knnMatch    cv2.drawMatchesKnn
```

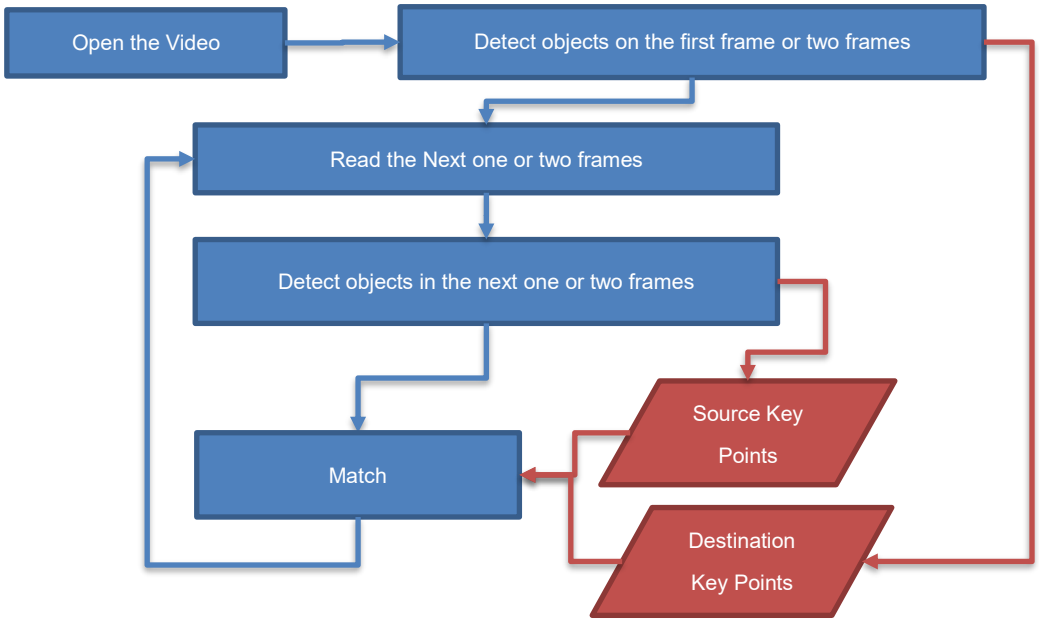
5. Open CV Image Arithmetic APIs Utilized

```
cv2.bitwise_or
```

6. Open CV Drawing APIs Utilized

```
cv2.drawContours       cv2.line
```

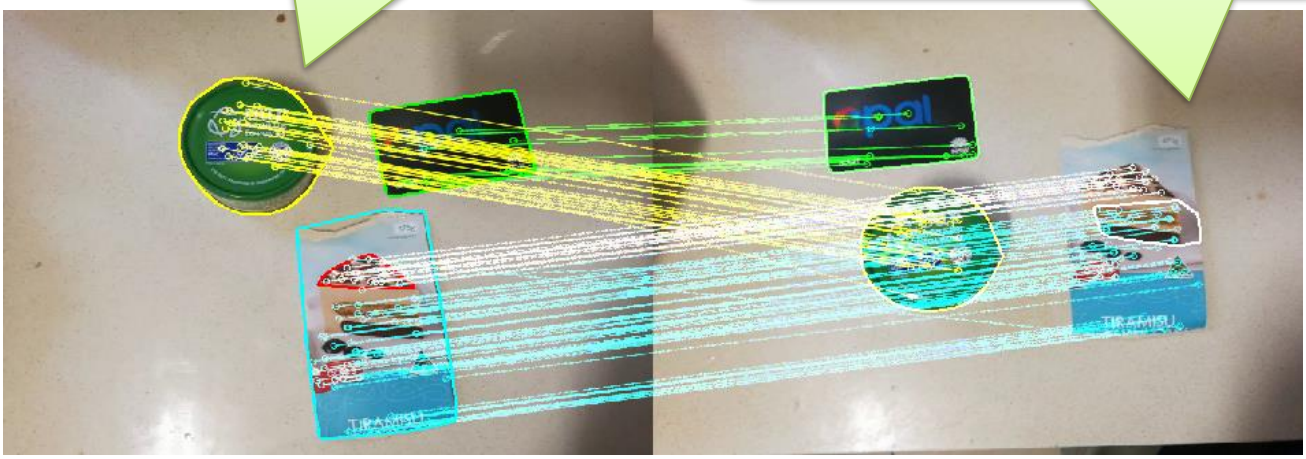
Logical Structure Overview of this Program



Single Thread Mode of this Program

Automatically detect objects and draw contours of them in different colours

Match corresponding objects in subsequent frames of this video.
There may be failures of contour detection.



Multiple Thread Mode of this Program to Utilize Multiple CPU cores

Each automatically detected objects are showed at top-left corner of each window

Contour of the object in following frames of this video will be detected

Pictures on the object may be detected wrongly as separated items.

Failures of contour detection may cause errors of trajectories.