

**School of Computing**  
**National University of Singapore**  
**CS4243 Computer Vision and Pattern Recognition**  
**Semester 1, AY 2013/14**

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**Lab 4 : Background Removal**

**Objectives:**

- Continue to learn to write Python functions.
- Learn to use OpenCV for removing background in video.

**Preparation:**

- Download the following files into your working directory: `removebg.doc`, `eagle-1.jpg`, `eagle-2.jpg`, `traffic-1.bmp`, `traffic-2.bmp`, `traffic.avi`.

**Part 0. Initialisation**

- Create a python script file called `rmbg.py`. Follow the rest of this lab instruction sheet to develop the script.
- Set the working directory, e.g., `d:/myname`, and import relevant modules.

```
import os
os.chdir("d:/myname")
import cv2
import cv2.cv as cv
import numpy as np
```

**Part 1. Remove Background Pixels in Video**

Write a program to do background removal in video using the following hints:

- Step 1: read the `.avi` video using the OpenCV Python API `cv2.VideoCapture`
- Step 2: print the frame width, frame height, frames per second and frame count of the input video using `cap.get`
- Step 3: convert frame width, frame height, frames per second and frame count into integers using `int()`
- Step 4: get the background object by averaging away the foreground (i.e. moving) objects using the following suggested codes:

```
_,img = cap.read()
avgImg = np.float32(img)
```

```

for fr in range(1,frameCount):
    _,img = cap.read()
    alpha = 1/float(fr+1)
    cv2.accumulateWeighted(img,avgImg,alpha)
    normImg = cv2.convertScaleAbs(avgImg) # convert into uint8 image
    cv2.imshow('img',img)
    cv2.imshow('normImg', normImg)
    print "fr = ", fr, " alpha = ", alpha
cv2.waitKey(0)
cv2.destroyAllWindows()

```

- Step 5: Extract the foreground objects using the following suggested codes:

```

cap = cv2.VideoCapture("/--- your directory ---/traffic.avi")
grAvgImg = cv2.cvtColor(normImg, cv2.COLOR_BGR2GRAY)
for fr in range(frameCount):
    _,img = cap.read()
    grImg = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    diffImg = cv2.absdiff(grImg, grAvgImg)
    thresh, biImg = cv2.threshold(diffImg, 0, 255,
cv2.THRESH_BINARY+cv2.THRESH_OTSU)
    fg = cv2.dilate(biImg, None, iterations = 2)
    bgtemp = cv2.erode(biImg, None, iterations=3)
    thresh2, bg = cv2.threshold(bgtemp, 2, 255, cv2.THRESH_BINARY_INV)
    res = cv2.bitwise_and(img, img, fg, fg)
    cv2.imshow('foreground', res)
    cv2.waitKey(100)
    fg = res
    cv2.imshow('Binarized Image', biImg)
    cv2.waitKey(0)
    cv2.imshow('foreground Image', fg)
    cv2.waitKey(0)
    cv2.imshow('background image', bg)

```

```
cv2.waitKey(0)
cv2.destroyAllWindows()
cap.release()
```

Part 2. Submit your program, explain the functions used, and write down and explain the equation used to do the averaging.

### **Submission Instructions**

Submission during lab session:

- Show the output video to the TA.

Submit also the following:

1. Print-out of your Python program.
2. Print-out of the results
3. Submit the softcopy of your Python program to IVLE

Please put your python program in a folder and submit the folder. Use the following convention to name your folder:

MatriculationNumber\_yourName\_Lab#\_Session. For example, if your matriculation number is A1234567B, and your name is Chow Yuen Fatt, for this lab, your file name should be A1234567B\_ChowYuenFatt\_Lab4\_Wed630pm.

Remember to write your name, matriculation number, and lab group number on the hardcopy print-outs.