# Computer Vision

Assignment 0

Archit Kumar

2018201051

# Converting video into images

Following code converts the video "movie.mp4" into its constitutent images and save them into ./images folder

link of sample video (https://drive.google.com/file/d/1gVjPJzTdlS6uVo-0bdJjiLwhll1n5KCE/view?usp=sharing)

In [9]:
```
import cv2 as cv

video = cv.VideoCapture('movie.mp4')
status , image = video.read()
count =  0
while status :
    cv.imwrite("images/%d.jpg"%count , image)
    status , image = video.read()
    count += 1
```

**sample output**

Frame 0

Frame 50

# Merging a set of images into single video

Following code works as follows :

1. iterate through each image in the given folder ./images and stores the name in 'files' list in sorted order
2. open each image in 'files' list using 'cv.imread' function and store into array.
3. use video.writer function to write images into video buffer .
4. finally save video using release function.
5. Frame rate is controlled by **"fps"**

**sample images**

In [12]:
```
import cv2 as cv
import numpy as np
import os
from os.path import isfile ,  join
import locale

path_in  = './images/'
path_out = 'video.mp4'
fps = 23.0 # Frame Per second

array = []
files = [int(f.split('.')[0]) for f in os.listdir(path_in)]
files.sort()

for i in range(len(files)):
    filename = path_in + '%d.jpg'%files[i]
    img = cv.imread(filename)
    height , width , layers = img.shape
    size = (width,height)
    array.append(img)

out = cv.VideoWriter(path_out , cv.VideoWriter_fourcc(*'mp4v') , fps , size)
for i in range(len(array)):
    out.write(array[i])
out.release()
```

**output**
link for output video (https://drive.google.com/file/d/1gVjPJzTdlS6uVo-0bdJjiLwhll1n5KCE/view?usp=sharing)

# Capturing Images from Webcam

Following code accesss webcam and show the images into a new window. on pressing space image is captured and stored into ./cam folder . on pressing escape window is closed.

In [8]:
```
import cv2 as cv
cam = cv.VideoCapture(0)
cv.namedWindow("test")
img_counter = 0

while True :
    ret , frame = cam.read()
    cv.imshow("test",frame)
    if not ret :
        break
    k = cv.waitKey(1) #waiting for key press
    if k%256 == 27:
        print "Escape hit , closing"
        break
    elif k%256 == 32 :
        print "image is captured and saved into ./cam folder"
        cv.imwrite("./cam/%d.png"%img_counter,  frame)
        img_counter = img_counter + 1
cam.release()
cv.destroyAllWindows()
```

```
image is captured and saved into ./cam folder
Escape hit , closing
```

# Chroma Keying

Chroma keying, is a visual effects/post-production technique for compositing (layering) two images or video streams together based on color hues.

Working of different functions are as follow :

**colorclose function**
this function simply calculate a mask which will be used in merging.
Input : A 1*3 array which corresponds to pixel value into [y cb cr] color space.
output : 0 or 255 based on the closesness of input pixel with keycolor.

**result function**
this function returns the merged frame
Input : two image frame which corresponds to foreground and background video
output : merged frame
working : based on mask ($\alpha$) obtained from colorclose function , pixel value of output image is calculated as follow :

$$out(i,j) = (1-\alpha) * foreground(i,j) + \alpha * background(i,j)$$

*rest code simply captures frames from input video and output video in loop and output frame from "result" function is simply added into buffer needed for final video.*

**Input videos link**
background video (https://drive.google.com/file/d/1M57JBcu-XkP8hdBTiH280h_tvqKD_vm2/view?usp=sharing)
foreground video (https://drive.google.com/file/d/1i6LdceJjSuoJV9EYdXH_04guXURbwfsl/view?usp=sharing)

In [ ]:
```
import cv2
import numpy as np
import math
from PIL import Image


key_color = (149,44,21)
tolerance = [50,130]
[y_key , cb_key ,cr_key] = key_color


def colorclose(arr):
    y , cb_p , cr_p = arr
    temp = math.sqrt((cb_key-cb_p)**2 + (cr_key - cr_p)**2)
    if temp < 100  :
    else:
        z = 1.0
    return 255.0*z

def result(foreground , backgronud):
    forycbcr = cv2.cvtColor(foreground, cv2.COLOR_BGR2YCrCb)
    alpha = np.apply_along_axis(colorclose , 2, forycbcr)
    alpha = np.uint8(255-255*(alpha/255))
    alpha = cv2.cvtColor(alpha, cv2.COLOR_GRAY2BGR)

    alpha = alpha.astype(float)/255
    foreground = foreground.astype(float)
    backgronud = backgronud.astype(float)

    foreground = cv2.multiply(1.0 - alpha, foreground)
    backgronud = cv2.multiply(alpha , backgronud)

    outImage = cv2.add(foreground , backgronud)
    return  outImage


vidcap1 = cv2.VideoCapture('jets.mp4')
vidcap2 = cv2.VideoCapture('back.mp4')
frame_array = []
fps = 15.0


success1 , image1 = vidcap1.read()
success2 , image2 = vidcap2.read()
count = 0
while success1 and success2 and count < 250:
    image1 = cv2.resize(image1 , (800,600), interpolation = cv2.INTER_AREA)
    image2 = cv2.resize(image2 , (800,600), interpolation = cv2.INTER_AREA)
    result_img = result(image1 , image2)
    count = count+1

    print "merged %d frames" %count
    frame_array.append(result_img)
    success1 , image1 = vidcap1.read()
    success2 , image2 = vidcap2.read()

out = cv2.VideoWriter("merged.mp4", cv2.VideoWriter_fourcc(*'mp4v') , fps , (
for i in range(len(frame_array)):
    out.write(frame_array[i].astype(np.uint8))
out.release()
```

**output video**

merged video (https://drive.google.com/file/d/1pV7rgMM7qmFhi8fi1yDZDu7AlXHTUpC7/view?usp=sharing)