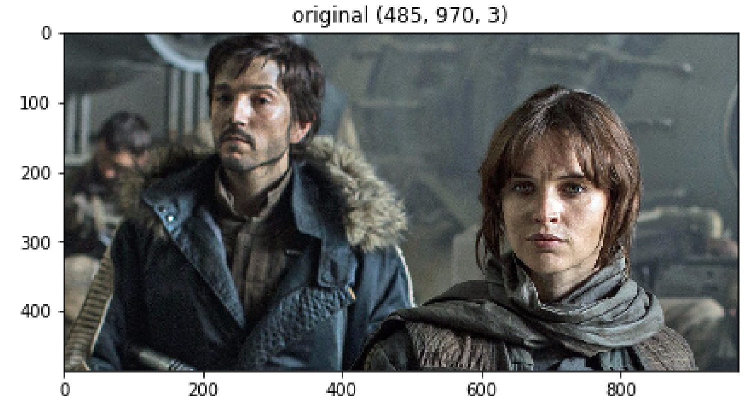
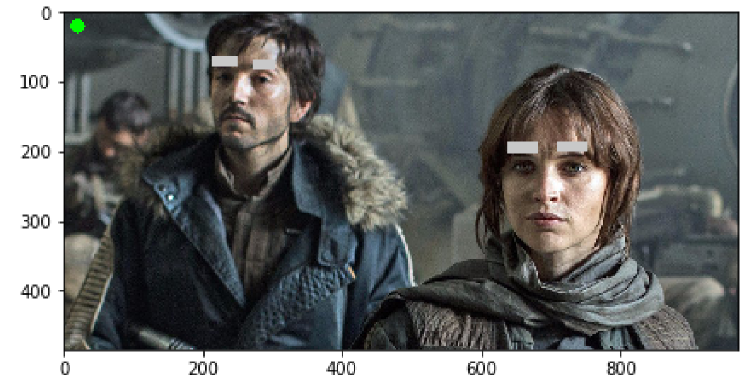
Lab 3: Computer Vision

Detection

This lab will exercise your understanding of face detection and AR markers. You will be working with a video stream, so we will **not** use a jupyter notebook. Unfortunately jupyter is not good with live video, however, they are working on on adding that feature.





You are going to build a python program that will manipulate a video stream from your laptop and do:

- watch for movement (change detection)
- detect faces/eyes
- draw funny things on people (nothing inappropriate)
- detect AR markers
- indication whether it is currently detecting faces or not
- [**Bonus**] do star wars stuff

Authorized Resources

You may only get help within your group or from the instructor. Do not talk to other groups or other cadets about this lab.

Displaying Video in Python

Since we are not using a jupyter notebook for this, you need to be able to display video in a window when running python from the command line. Here is some code from lesson 11 to get you started:

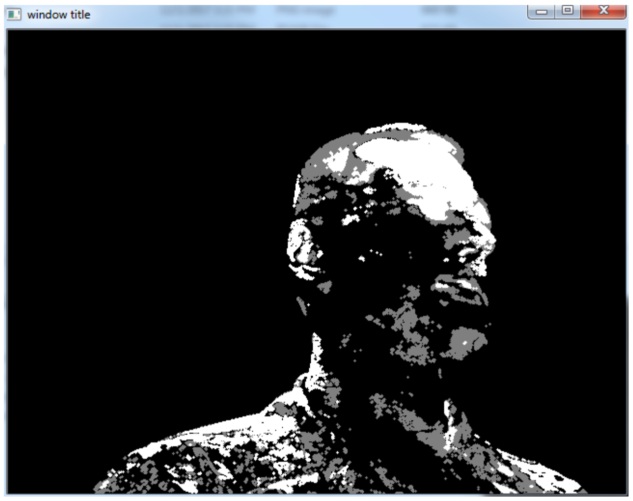
```
#!/usr/bin/env python

from __future__ import print_function
from __future__ import division
import cv2
import time

def detectChange(img):
    pass

def findFaceEyes(img):
    pass

def drawFunny(img):
    pass

def starWars(img):
    pass

if __name__ == "__main__":
    # we want to capture the default camera: 0
    # if we had other cameras attached on USB ports, we could
    # pass in 1, 2, 3, etc to pick which one
    cam = cv2.VideoCapture(0)

    # loop forever
    while True:
        # reading the camera returns 2 things:
        #    good: was the image successfully captured - True/False
        #    img: if successful, then img is a good/valid image
        good, img = cam.read()
        if good:
            cv2.imshow('window title', img)  # you can name the
                                             # window anything
            key = cv2.waitKey(10)  # wait 10 ms. If you put 0, then
                                   # it will wait forever for a
                                   # key press.
            if key == ord('q'):
                break  # q = quit, break out of loop
        time.sleep(0.03)  # sleep for a little

    cam.release()  # close camera
    cv2.destroyAllWindows() # clean up GUI
```

Hint: It might be easier to start off working in jupyter on an image. Build your filter and get it working. Then move on to reading in a video stream and applying your filter to each frame.

Lab 3

Create a python program (or separate programs) and do the following:

[20 pts] Task 1: Change Detection



1. Open a window and display the live camera feed
2. Check the image for change
    1. In a corner of the image put a marker, like a small red circle to indicate there is nothing there
3. Once there is movement/change, display only the change
    1. Update the marker in the corner to show you have detected change
    2. *Hint:* You might need some filtering/morphological ops to clean up the image

[50 pts] Task 2: Face Detection

1. Using an OpenCV filter, find faces and eyes in each image when the image changes
2. Using the identified face/eye locations do two of these things
    1. Put glasses on each person using OpenCV drawing commands
    2. Put a hat on each person
    3. Draw funny eyebrows
        1. You can even animate them
    4. Something else . . . if you have an idea ask your instructor first

[30 pts] Task 3: AR Markers

1. Generate AR markers according to the libraries directions. Show the image and the marker number in your video feed.
    1. *NOTE:* the library can only detect 1 marker in the image, no more
2. Change what you draw on people based on the AR marker, so you will need to have a couple of them.

[10 pts] Bonus

Instead of doing Task 2 like described, everything you do has to be tied to Star Wars, like:

- Put Darth Vader's, Boba Fett's, Jango Fett's, or a storm trooper's helmet on people
- Put one of Queen Amidala crazy outfits, headdress, or hats on people.
- Use an AR marker to determine which outfit will go on people
- Something else ... if you have an idea ask your instructor first

To do it right is hard, so cut corners if you have to

Here is a simple top hat I did: