Computational Perception and Artificial Intelligence
Marist School

Assignment: Application of Template Matching, Image Derivatives, and Gradients to Live Video Images

Requirements:

1. Create a new python file in ps04 named "cameraTest.py".

2. Copy the code at http://nebomusic.net/perception/code_samples/simple_camera_example.txt and paste it into the "cameraTest.py" file.

3. Run the code and make sure your camera is communicating with the software. Press 'q' to exit the program or click the red square on PyCharm.

4. Define the following functions inside cameraTest.py (You may copy and paste the code from ps04).

```python
def normalize(img):
    # returns a normalized numpy array in float datatype

def getDeltaX(A):
    # returns a derivative image on the x direction with the same
    # dimensions as A

def getDeltaY(A):
    # returns a derivative image on the y direction with the same
    # dimensions as A

def getGradient(img):
    # returns distances, thetas
    # where distances is a 2D array of the magnitude of the gradient
    # thetas is a 2D array of the angle of the gradient
```

5. Create a patch image of your face and save it as "mypatch.png" in the inputs folder of ps04. (You will want to take a "snip" of the live video stream to make your face patch.)

6. Modify the code inside the #Camera Loop to show the following images:
   a. The Real Color Image (This is already done in the code)
   b. DX: The derivative in the X direction
   c. DY: The derivative in the Y direction
   d. Magnitude: The magnitude of the Gradient
   e. Thetas: The angle of the Gradient
   f. Find: Use the `cv2.matchTemplate(gray, patch, cv2.TM_SQDIFF_NORMED)` command and find your face on the camera stream and draw a red box around the find.

7. Run the code and make sure all five images from step 5 are showing.

8. Submit the cameraTest.py file in Google Classroom.