Assignment

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Question

Write a Python program to display your face captured by the web camera of your laptop with one of your favorite linear mapping techniques + histogram and one of your favorite nonlinear technique + histogram in the same frame.

Answer

```
import cv2
import numpy as np

def show_histogram(image):
    his_img = np.zeros((300, 256, 3), np.uint8)
    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    his = cv2.calcHist([gray], [0], None, [256], [0, 256])
    cv2.normalize(his, his, 0, 300, cv2.NORM_MINMAX)
    for x in range(256):
        y = int(his[x][0])
        cv2.line(his_img, (x, 300), (x, 300 - y), (255, 255, 255), 1)
    return his_img

def linear1(image):
    r = image / 255.0
    s = 1.0 - r
    s = np.uint8(s * 255)
    return s

def non_linear(image, gamma):
    r = image / 255.0
    c = 1.0
    s = c * np.power(r, gamma)
    s = np.uint8(s * 255)
    return s

def main():
    cam = cv2.VideoCapture(0)
    while True:
        ret, frame = cam.read()

        gamma_img = non_linear(frame, 2.0)
        linear_img = linear1(frame)
        row1 = np.hstack((frame, gamma_img, linear_img))

        hist_main = show_histogram(frame)
        hist_gamma = show_histogram(gamma_img)
        hist_linear = show_histogram(linear_img)
        row2 = np.hstack((hist_main, hist_gamma, hist_linear))

        row2_resized = cv2.resize(row2, (row1.shape[1], row2.shape[0]))
        final_show = np.vstack([row1, row2_resized])
        cv2.imshow("Original | Gamma (0.5) | Linear + Histograms", final_show)

        if cv2.waitKey(1) == ord('q'):
            break

    cam.release()
    cv2.destroyAllWindows()

if __name__ == '__main__':
    main()
```

Output Screenshot