Cartoonization using Edge Detectors

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Write the OpenCV code for photograph cartoonization using various edge detection operators. Show the output of the process using the following operators:

- **Prewitt's operator**
- **Sobel's operator**
- **Kirsch operators**
- **Canny operator**
- **LoG operator**

```
# importing modules
import cv2
import numpy as np
```

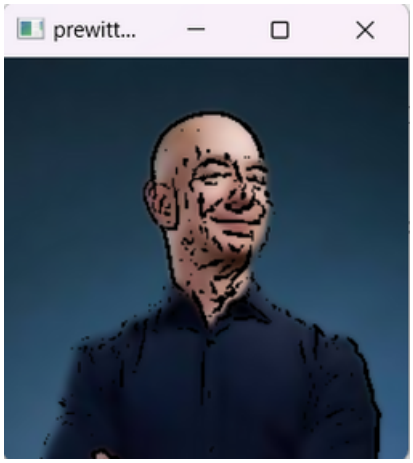
Prewitt's Operator

```
def prewitt_edge_detection(image):
    kernels = [np.array([[-1, -1, -1], [0, 0, 0], [1, 1, 1]]),
               np.array([[-1, 0, 1], [-1, 0, 1], [-1, 0, 1]])]

    results = [cv2.filter2D(image, cv2.CV_64F, kernel) for kernel in kernels]
    magnitude = np.max(results, axis=0)

    # Normalize and convert to uint8
    magnitude = cv2.normalize(magnitude, None, 0, 255, cv2.NORM_MINMAX, cv2.CV_8U)
    magnitude=inverseAndthreshold(magnitude)

    return magnitude

pre_edges=prewitt_edge_detection(gray)
pre_cartoon=cartoon(pre_edges)
```

Original Image

Intermediate Image

Cartoonized Image



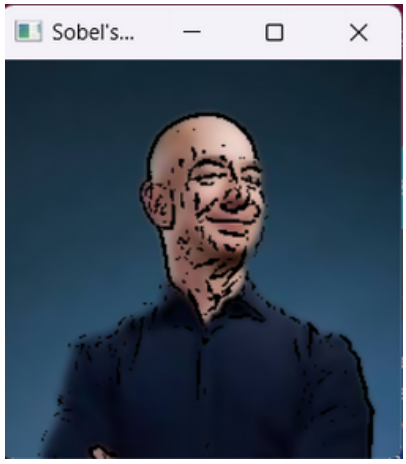
Sobel's Operator

```
def sobel_edge_detection(image):
    kernels = [np.array([[-1, -2, -1], [0, 0, 0], [1, 2, 1]]),
               np.array([[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]])]

    results = [cv2.filter2D(image, cv2.CV_64F, kernel) for kernel in kernels]
    magnitude = np.max(results, axis=0)

    # Normalize and convert to uint8
    magnitude = cv2.normalize(magnitude, None, 0, 255, cv2.NORM_MINMAX, cv2.CV_8U)
    magnitude=inverseAndthreshold(magnitude)

    return magnitude

s_edge=sobel_edge_detection(gray)
s_cartoon=cartoon(s_edge)
```

Original Image

Intermediate Image

Cartoonized Image

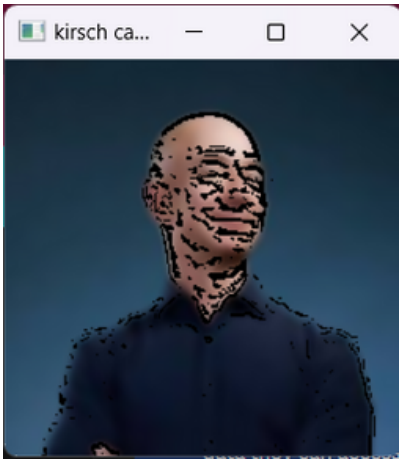


Kirsch Operator

```
def kirsch_edge_detection(image):
    kernels = [np.array([[-3, -3, 5], [-3, 0, 5], [-3, -3, 5]]),
               np.array([[-3, 5, 5], [-3, 0, 5], [-3, -3, -3]]),
               np.array([[5, 5, 5], [-3, 0, -3], [-3, -3, -3]]),
               np.array([[5, 5, -3], [5, 0, -3], [-3, -3, -3]]),
               np.array([[5, -3, -3], [5, 0, -3], [5, -3, -3]]),
               np.array([[-3, -3, -3], [5, 0, -3], [5, 5, 5]]),
               np.array([[-3, -3, -3], [-3, 0, -3], [5, 5, 5]]),
               np.array([[-3, -3, -3], [-3, 0, 5], [-3, 5, 5]])]

    results = [cv2.filter2D(image, cv2.CV_64F, kernel) for kernel in kernels]
    magnitude = np.max(results, axis=0)
```

```
    # Normalize and convert to uint8
    magnitude = cv2.normalize(magnitude, None, 0, 255, cv2.NORM_MINMAX, cv2.CV_8U)
    magnitude=inverseAndthreshold(magnitude)

    return magnitude

kirsch_edge=kirsch_edge_detection(gray)
k_cartoon=cartoon(kirsch_edge)
```

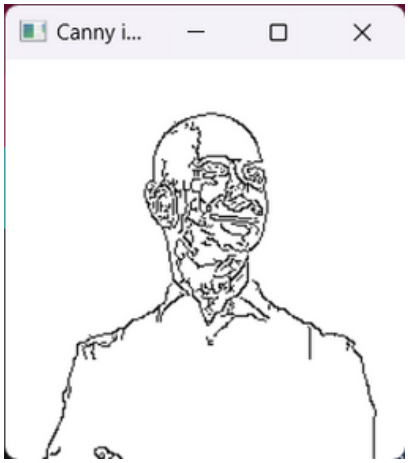
Original Image | Intermediate Image | Cartoonized Image

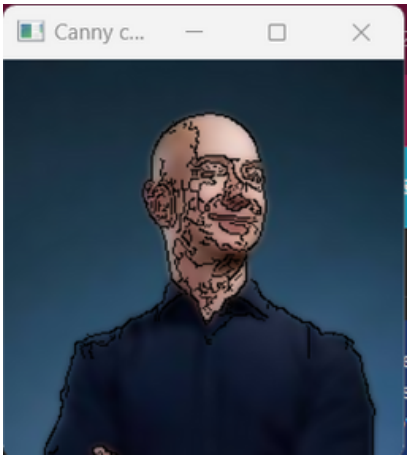


Canny Operator

```
def canny_edge_detection(image):
    edges = cv2.Canny(image, 50, 150)
    edges=inverseAndthreshold(edges)

    return edges

c_edge=canny_edge_detection(gray)
c_cartoon=cartoon(c_edge)
```

Original Image | Intermediate Image | Cartoonized Image





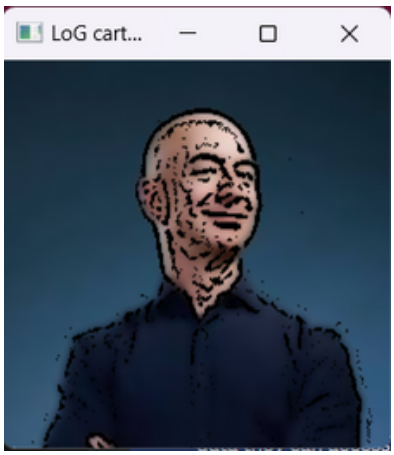
Laplacian of Gaussian Operator

```
def LoG_edge_detection(image):
    blurred = cv2.GaussianBlur(image, (5, 5), 0)

    # Apply Laplacian of Gaussian
    edges_log = cv2.Laplacian(blurred, cv2.CV_64F)

    # Normalize and convert to uint8
    edges_log = cv2.normalize(edges_log, None, 0, 255, cv2.NORM_MINMAX, cv2.CV_8U)
    edges_log=inverseAndthreshold(edges_log)

    return edges_log

l_edge=LoG_edge_detection(gray)
l_cartoon=cartoon(l_edge)
```

Original Image

Intermediate Image

Cartoonized Image



Other Functions and main function

```
def inverseAndthreshold(edge):
    edge=cv2.bitwise_not(edge)
    edge = cv2.adaptiveThreshold(edge,255,cv2.ADAPTIVE_THRESH_MEAN_C,cv2.THRESH_BINARY,9,9)

    return edge
```

```
def cartoon(edge):
    color=cv2.bilateralFilter(img,9,250,250)
    cartoon =  cv2.bitwise_and(color,color,mask=edge)

    return cartoon
```

```
img= cv2.imread("original.jpg")
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

cv2.imshow("orginal image",img)
cv2.imshow("gray",gray)
cv2.imshow("prewitt intermediate",pre_edges)
cv2.imshow("Sobel's intermediate",s_edge)
cv2.imshow("kirsch intermediate",kirsch_edge)
cv2.imshow("Canny intermediate",c_edge)
cv2.imshow("LoG intermediate",l_edge)
cv2.imshow("prewitt cartoon",pre_cartoon)
cv2.imshow("Sobel's cartoon",s_cartoon)
cv2.imshow("kirsch cartoon",k_cartoon)
cv2.imshow("Canny cartoon",c_cartoon)
cv2.imshow("LoG cartoon",l_cartoon)

cv2.waitKey(0)
```

Source Code Link:

https://github.com/Kirti-kn/Cartoonization_edge_detector

THANK YOU