

- 2. (, 2011).
 - 3.
1. (The Art of Electronics) 1993.

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3- .

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PYTHON
OPENCV

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. , OpenCV, .

Python

OpenCV [4, . 147].

OpenCV

[5, . 89]

thon Java

Windows, Linux, MacOS, iOS Android.

C++, Py-

[1, . 5]

Python.

[6, . 117]

1.

$$I_c(i, j), i = 1, 2, \dots, N_1, j = 1, 2, \dots, N_2, \quad (. 1).$$

img_gray = cv.cvtColor(img_original, cv.COLOR_BGR2GRAY)

cv.cvtColor,

cv.COLOR_BGR2GRAY [2, . 96].



1 -

2.

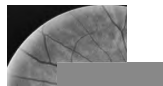
(.2, 3).

(CLAHE),

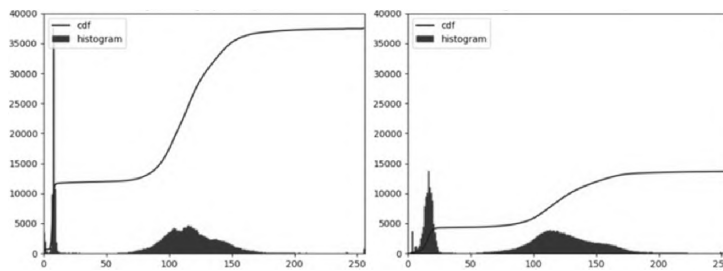
createCLAHE,

:

```
clahe = cv.createCLAHE(dipLimit=3.0, tileGridSize=(8,8))
img_clahe = clahe.apply(img_gray)
```



2 -



3 -

:

3.

top-hat

:

$$I_o = I - (I \bullet S_e) \quad S_e, \quad (1)$$

I_0 -

8,

<kernel> .

```

OpenCVcv:: morphologyEx,
g0 = cv.morphologyEx(img_dahe, cv.MORPH_CLOSE, kernel)
MORPH_CLOSE -
, dst = close(src, element) = erode(dilate(src, element)).

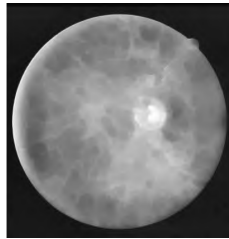
```

(.4).

```

g1 = cv.morphologyEx(g0, cv.MORPH_OPEN, kernel)

```



4-

MORPH_OPEN -

```

,
dst = open(src, element) = dilate(erode(src, ele-
ment)).

```

(.5).



5-

```

4.
,
3
5. ( .6).

```

bit-

wise_not.

```

g3_tmp = cv.bitwise_not(g2)

```

(- 0, - 255)



6 -

1. . . . , , 2015. 7

2. . . . , 2016. 210 . OpenCV.

3. . . . , 2012. 1104 .

4. . . . , OpenCV 3. . . . , 2017. 826 .

5. // - -

" - "

2015. 1. . 87-92.

6. // 2017. 16 (265). . 43. . 113-121.