Seeing with clojure

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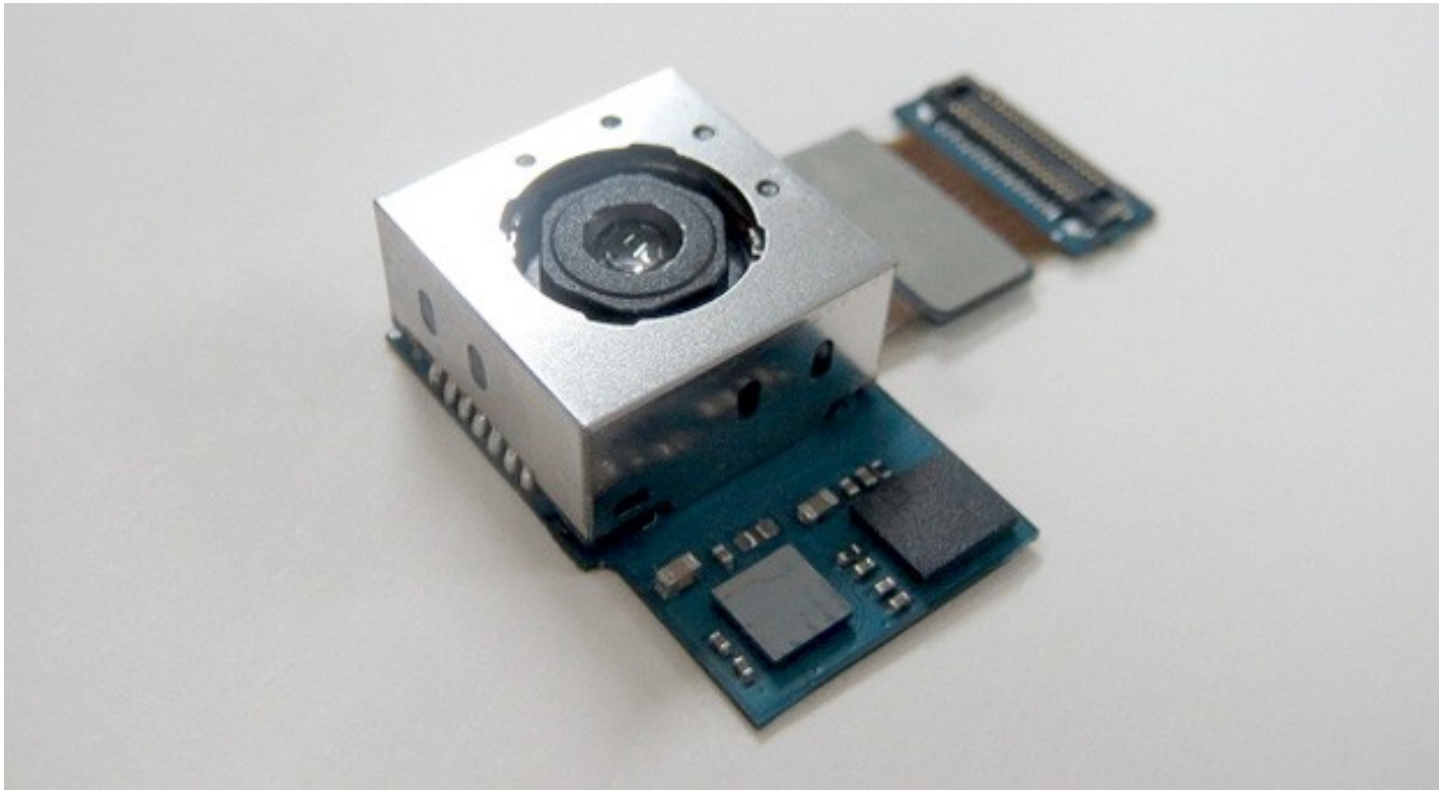
https://github.com/davesnowdon/cljex-2015-opencv

Most general purpose sensor



With great power comes...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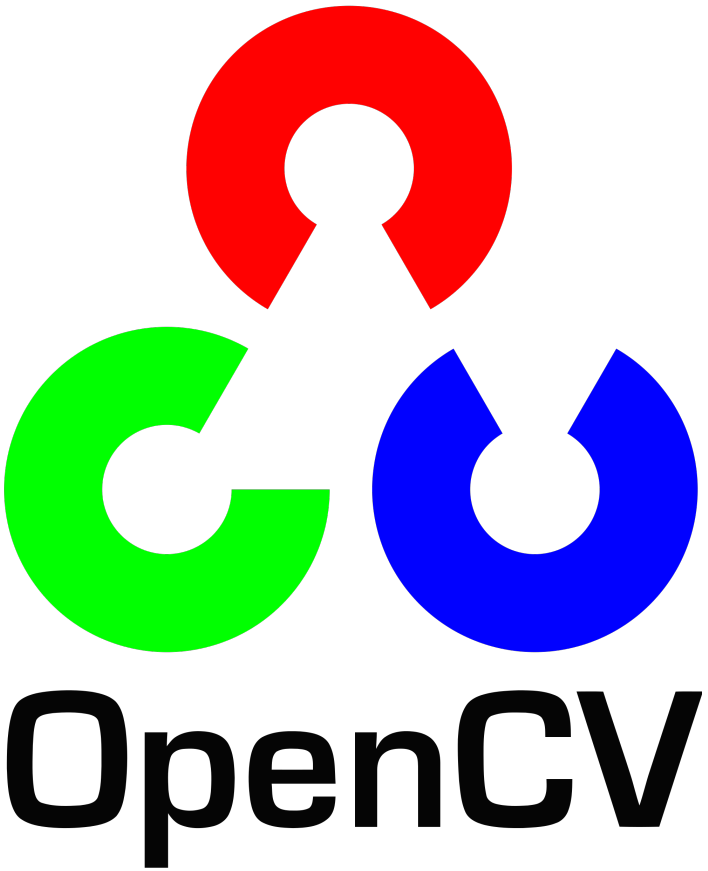
company
detected

This is hard

Can somebody please do this for me?

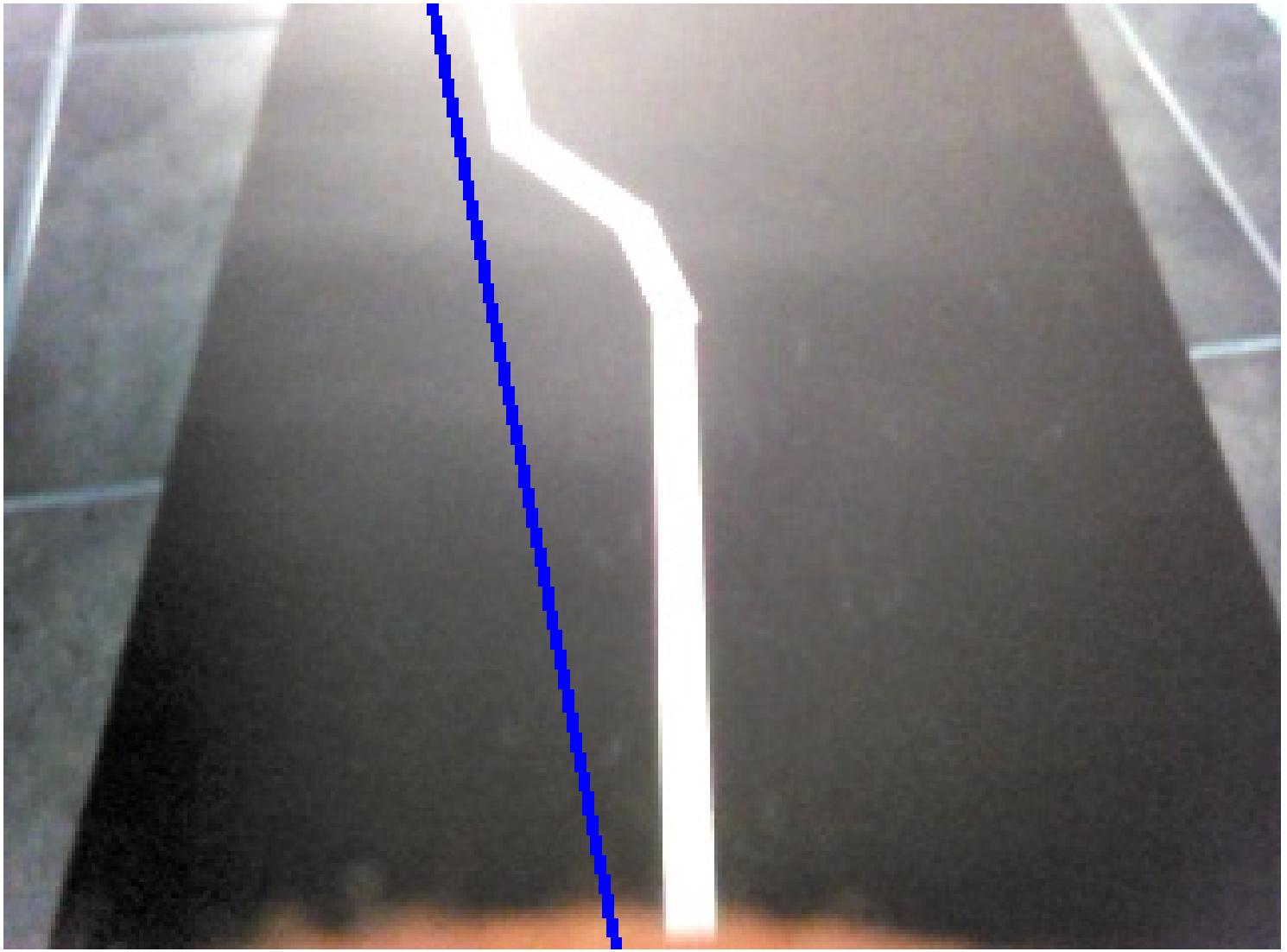
openCV



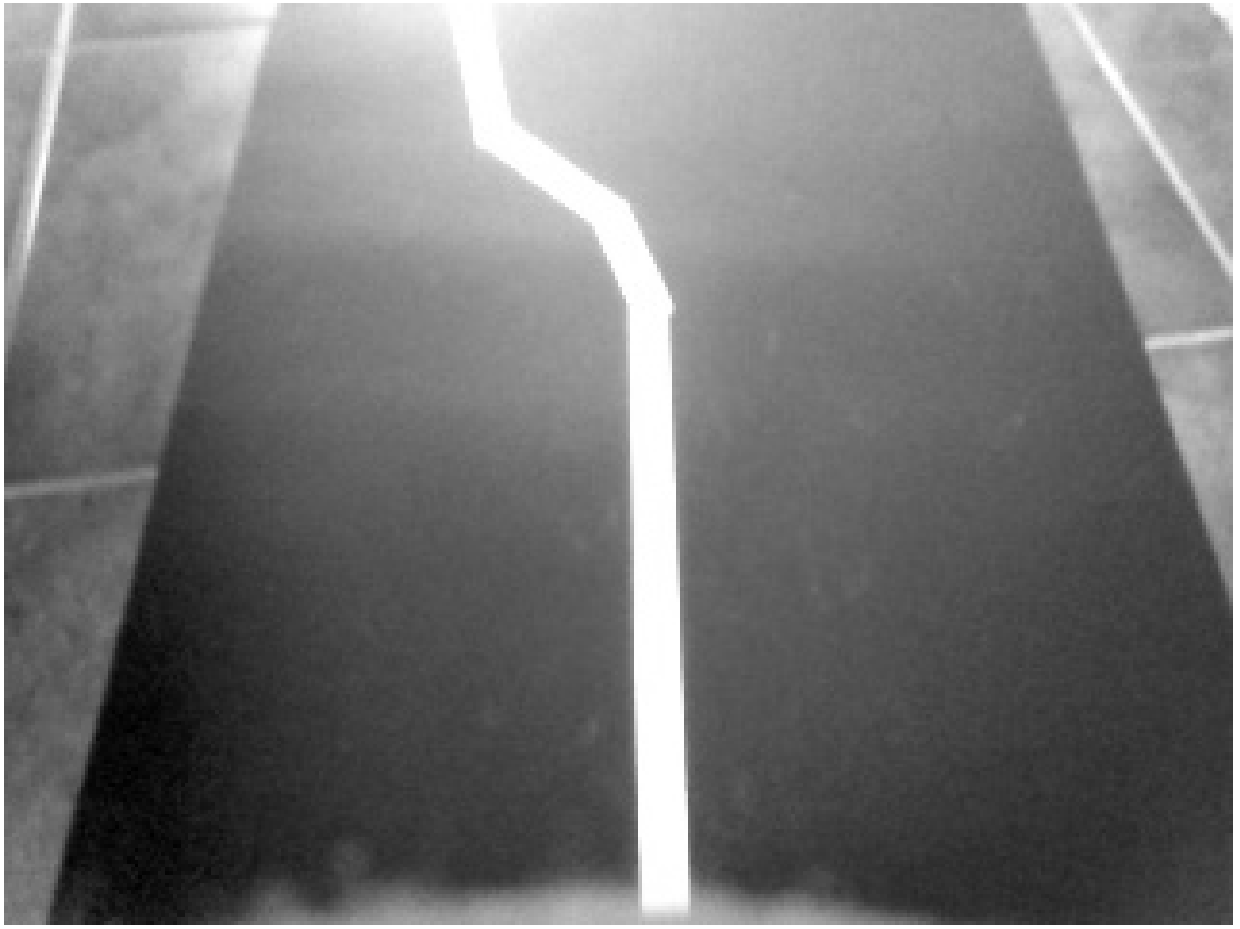
- Around since 1999
- Open source
- Multi-platform: windows, linux, mac, iOS, android, RaspberryPi
- C++, python, java

Line following

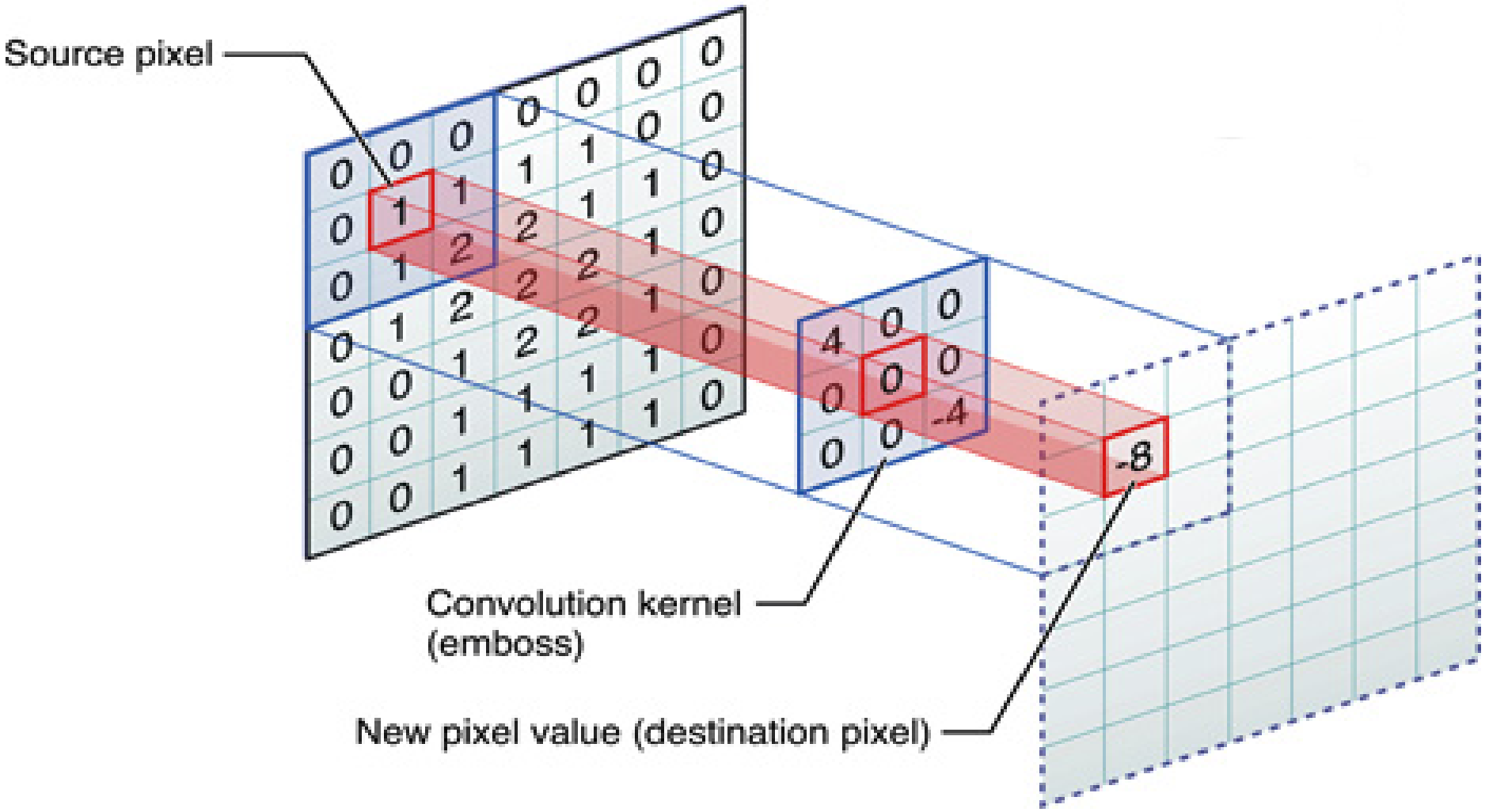
Demo: (show-line image)



(Imgproc/cvtColor src dest Imgproc/COLOR_BGR2GRAY)

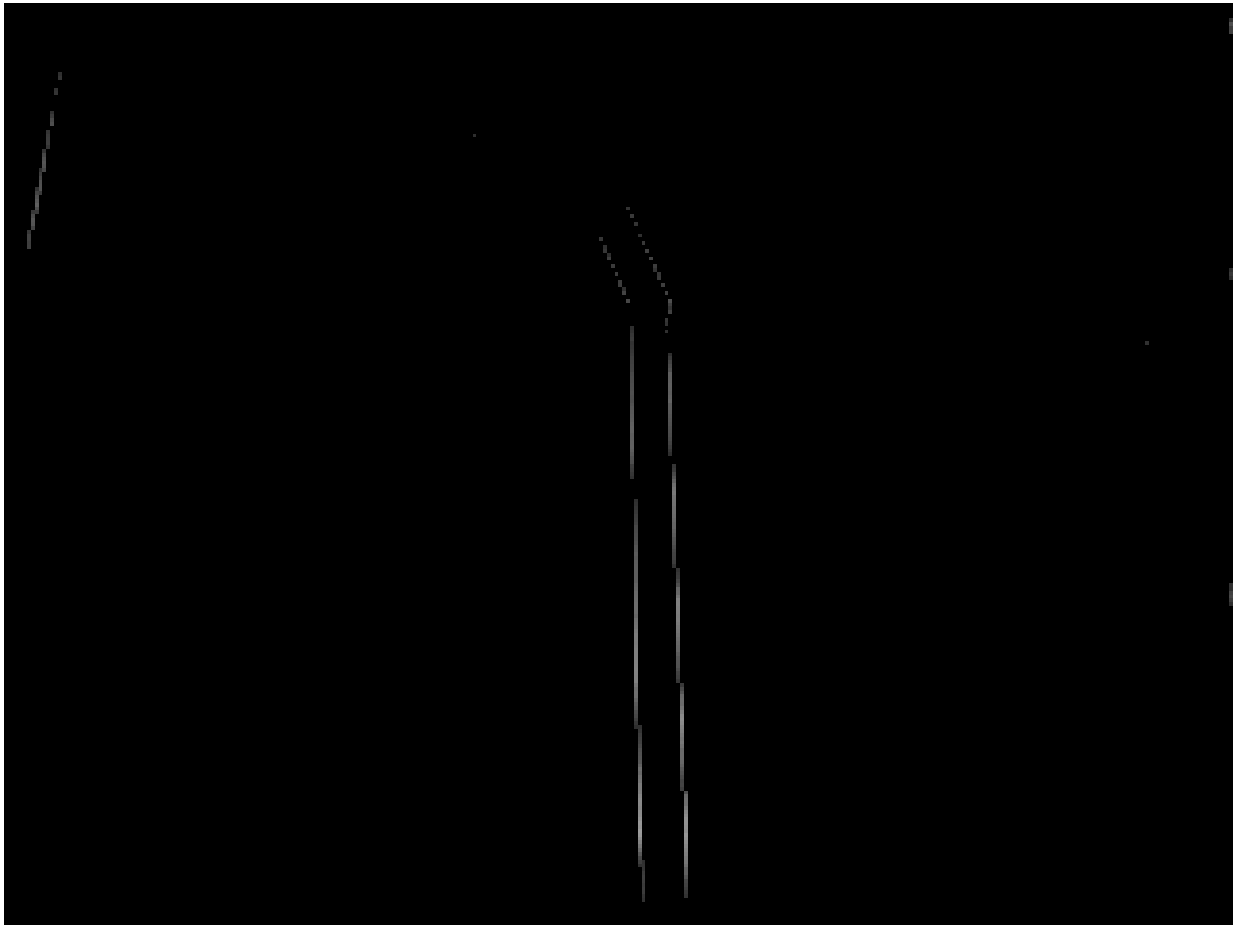


Convolution!



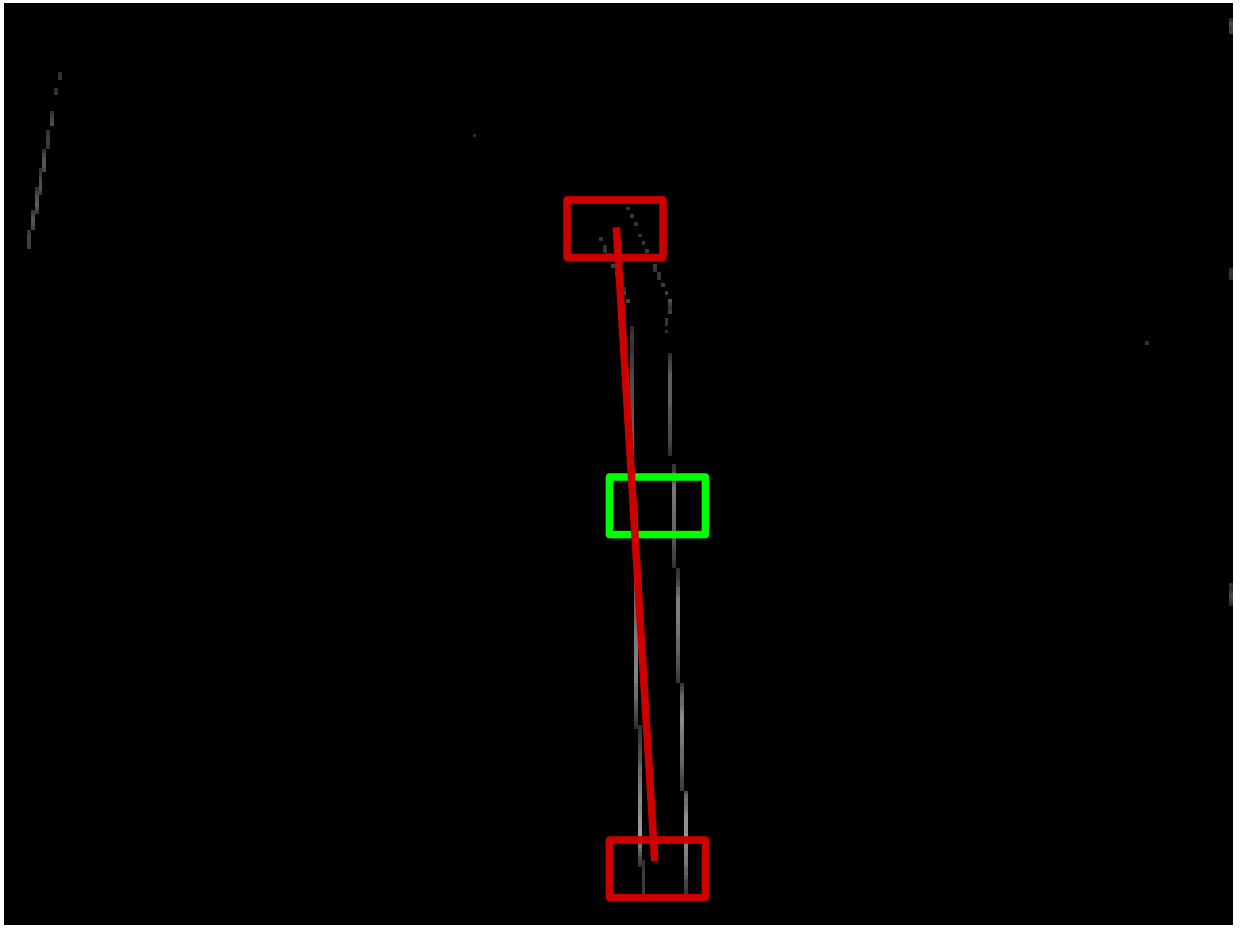
https://developer.apple.com/library/mac/documentation/Performance/Conceptual/vImage/ConvolutionOperations/ConvolutionOperations.html

(Imgproc/filter2D gray fil -1 kernel)
(Imgproc/threshold fil thresh 45.0 255
Imgproc/THRESH_TOZERO)

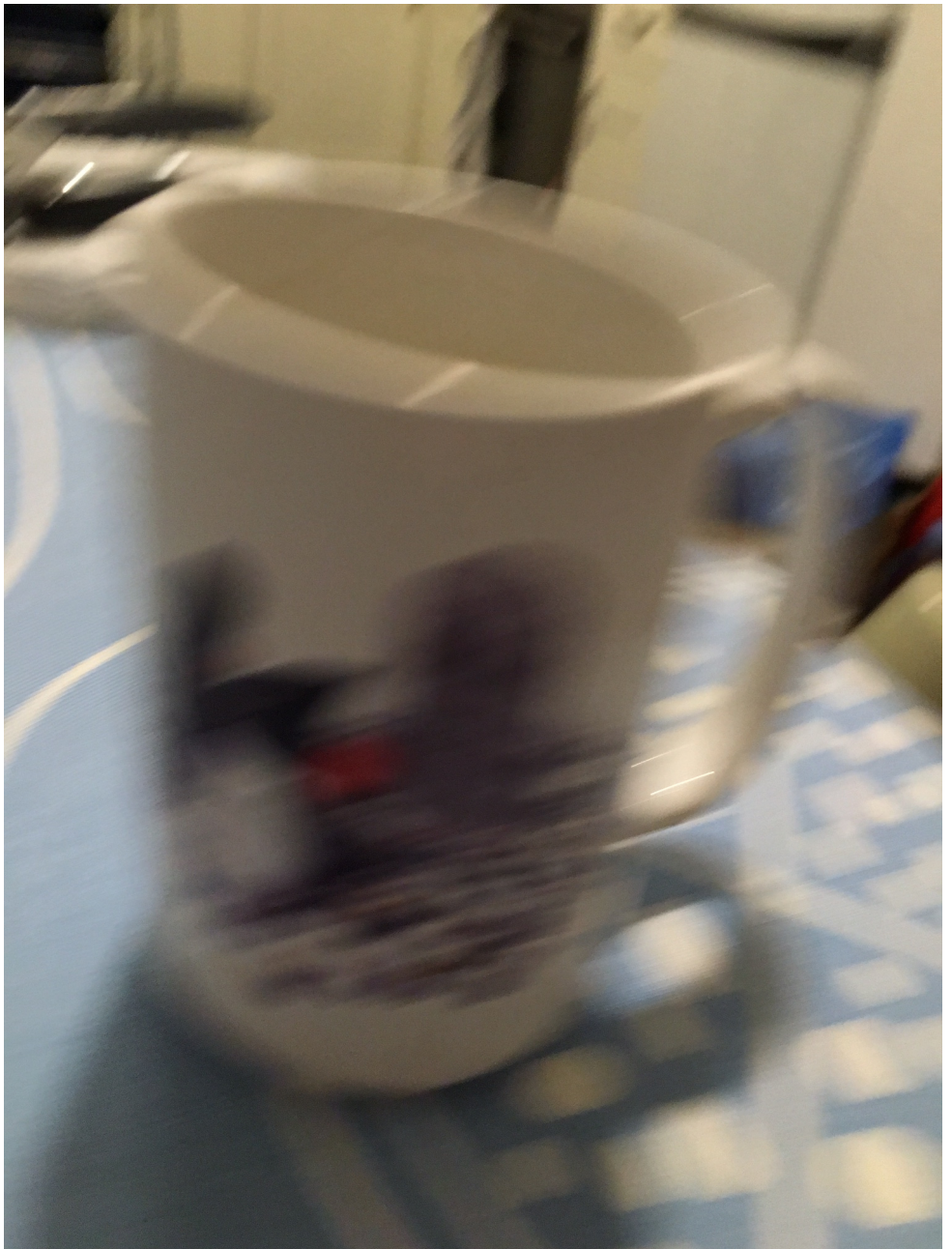


Kernel: [-1.0 2.0 -1.0]

Sample top, middle & bottom of line



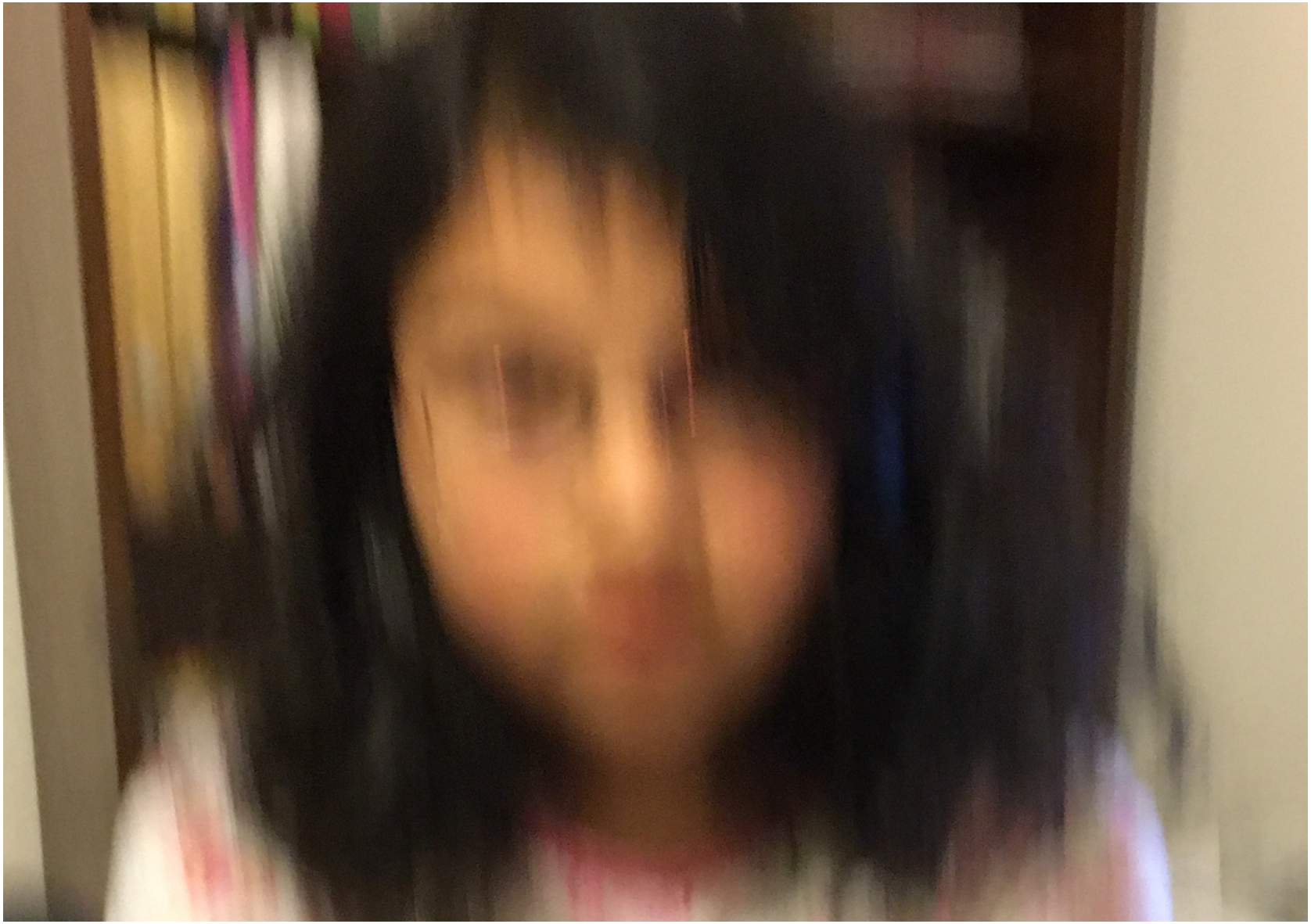
Blur Detection

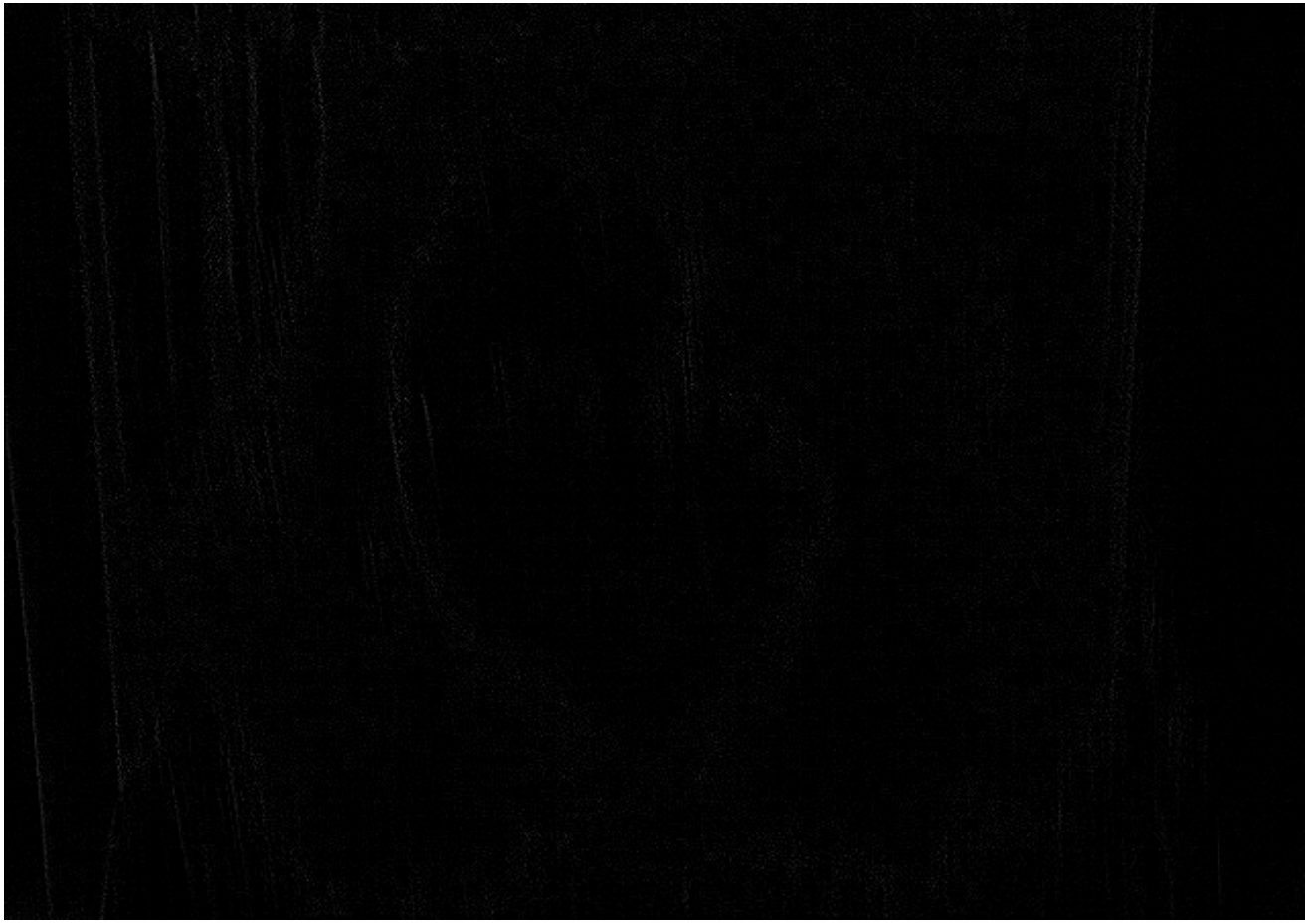


Demo: (is-image-blurry image)

(Imgproc/Laplacian src dest CvType/CV_64F)
(Core/meanStdDev dest mean stddev)

Variance: 195.92





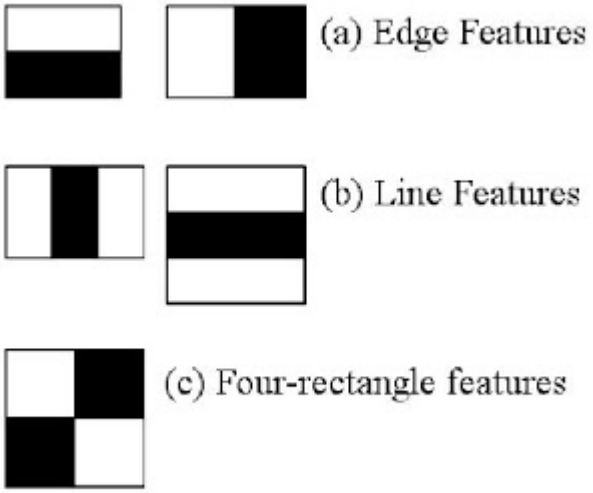
Variance: 58.5

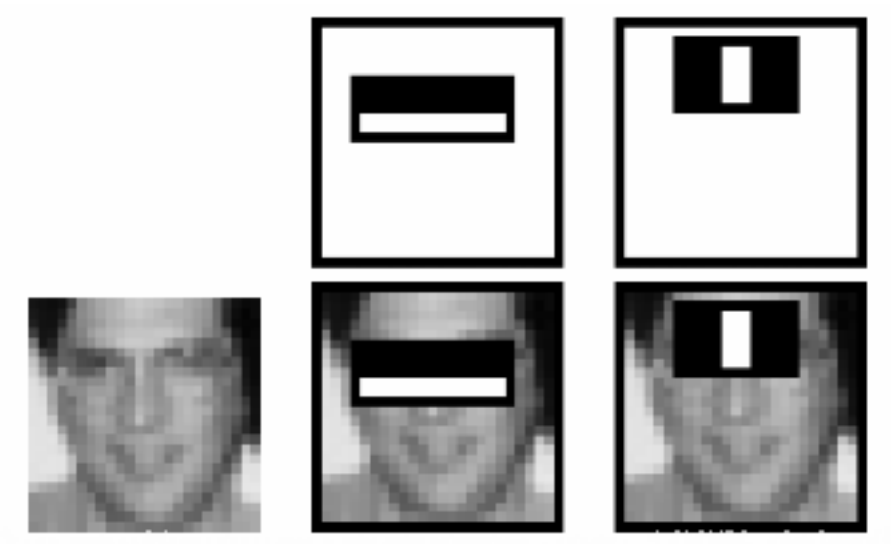
Face detection

Demo: (show-faces-and-eyes img)

(def clr (CascadeClassifier. “haarcascade_frontalface_default.xml”))
(.detectMultiScale clr img result)

Haar Classifier





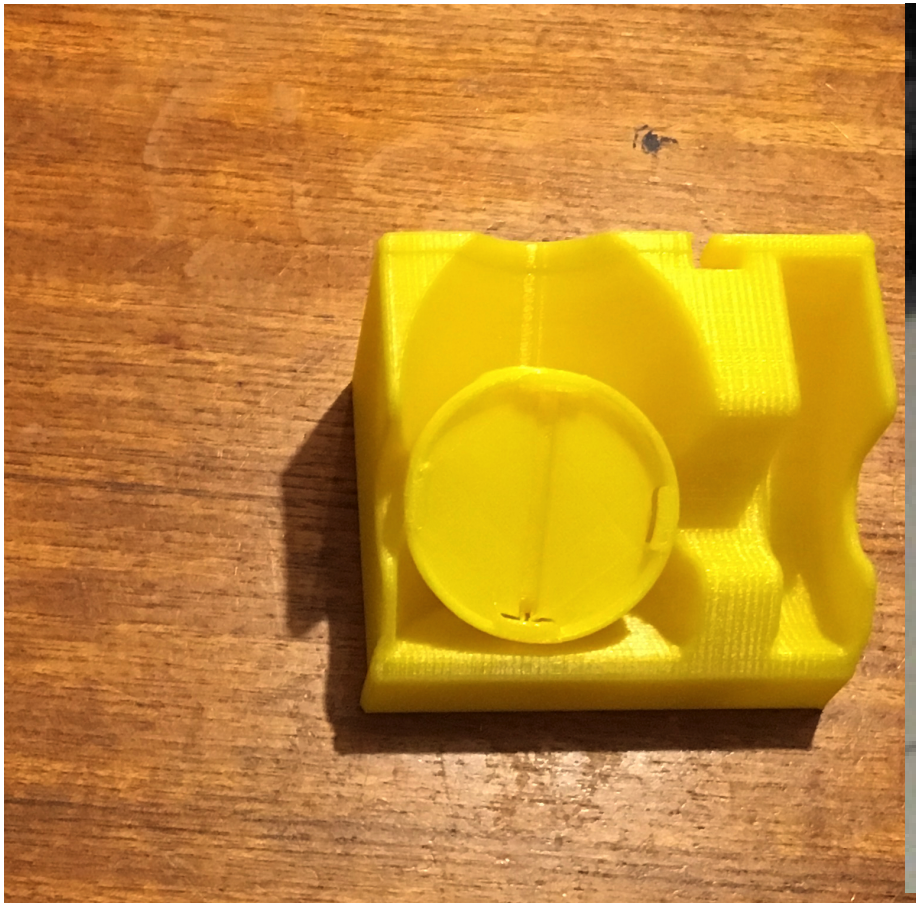
Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle.

http://docs.opencv.org/master/d7/d8b/tutorial_py_face_detection.html

Blob detection

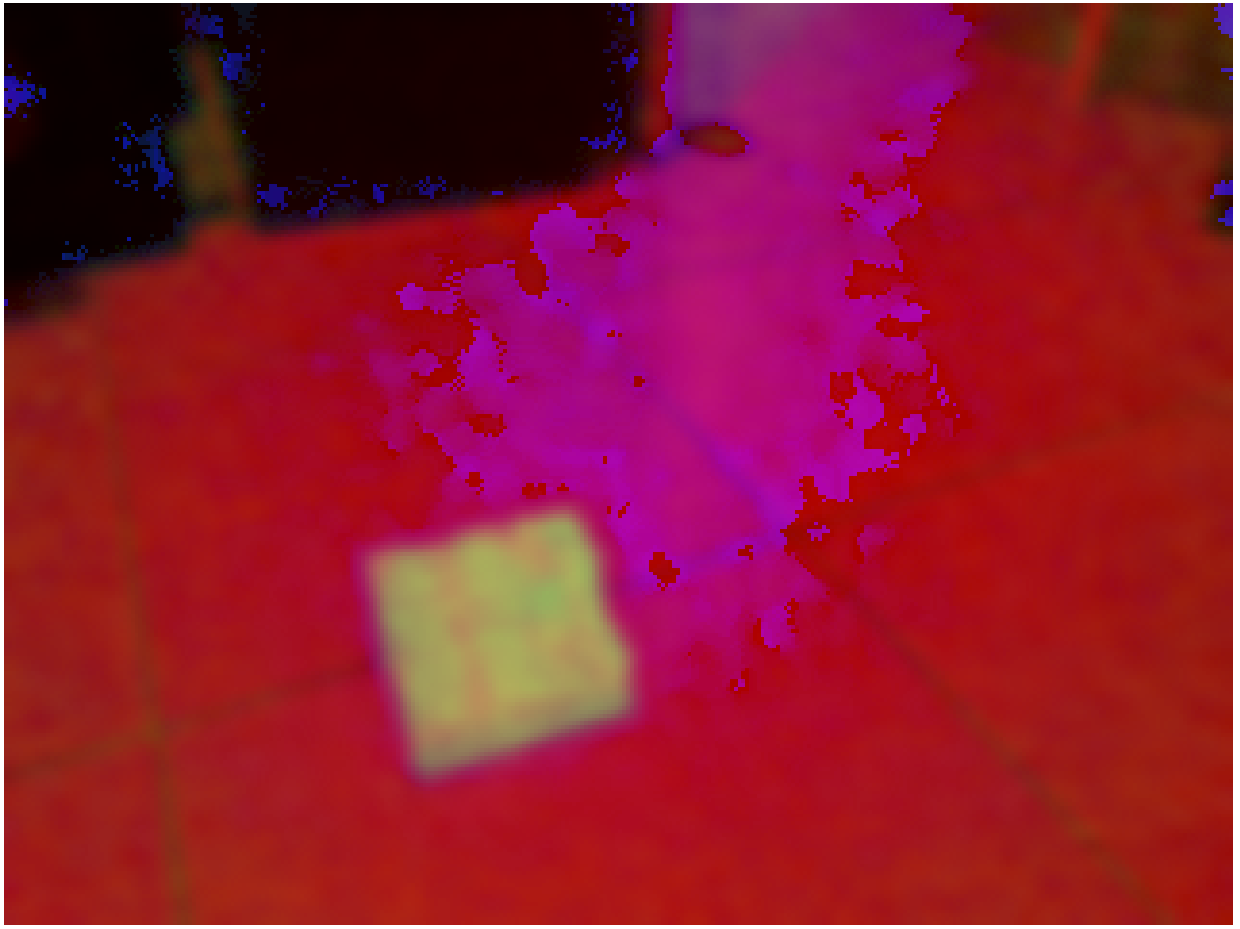
Demo: (show-blob blob-img
(Scalar. 84 80 80) (Scalar. 104 255 255))

Lighting can mess you up

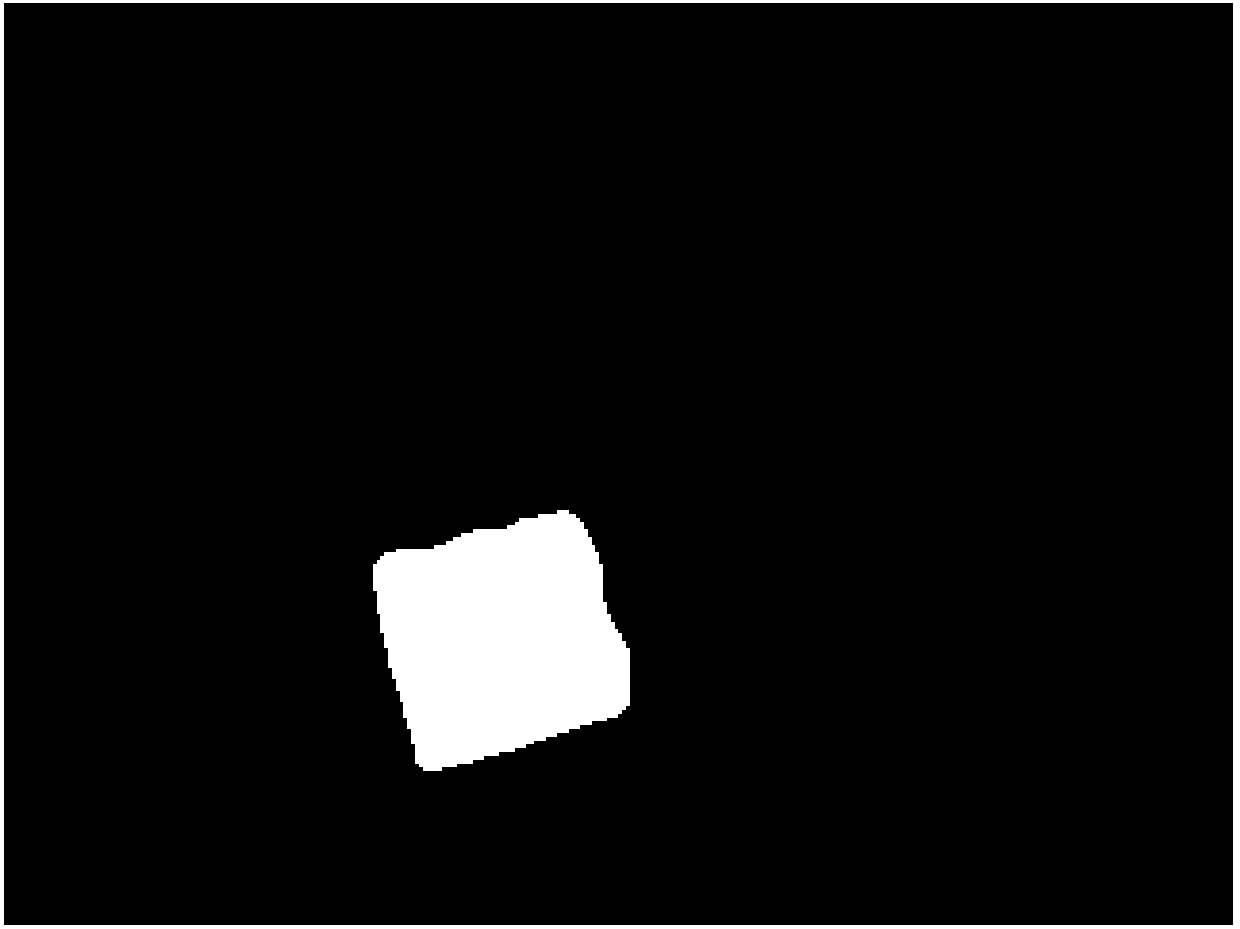


(Imgproc/GaussianBlur src dest (Size. 11 1) 0.0)

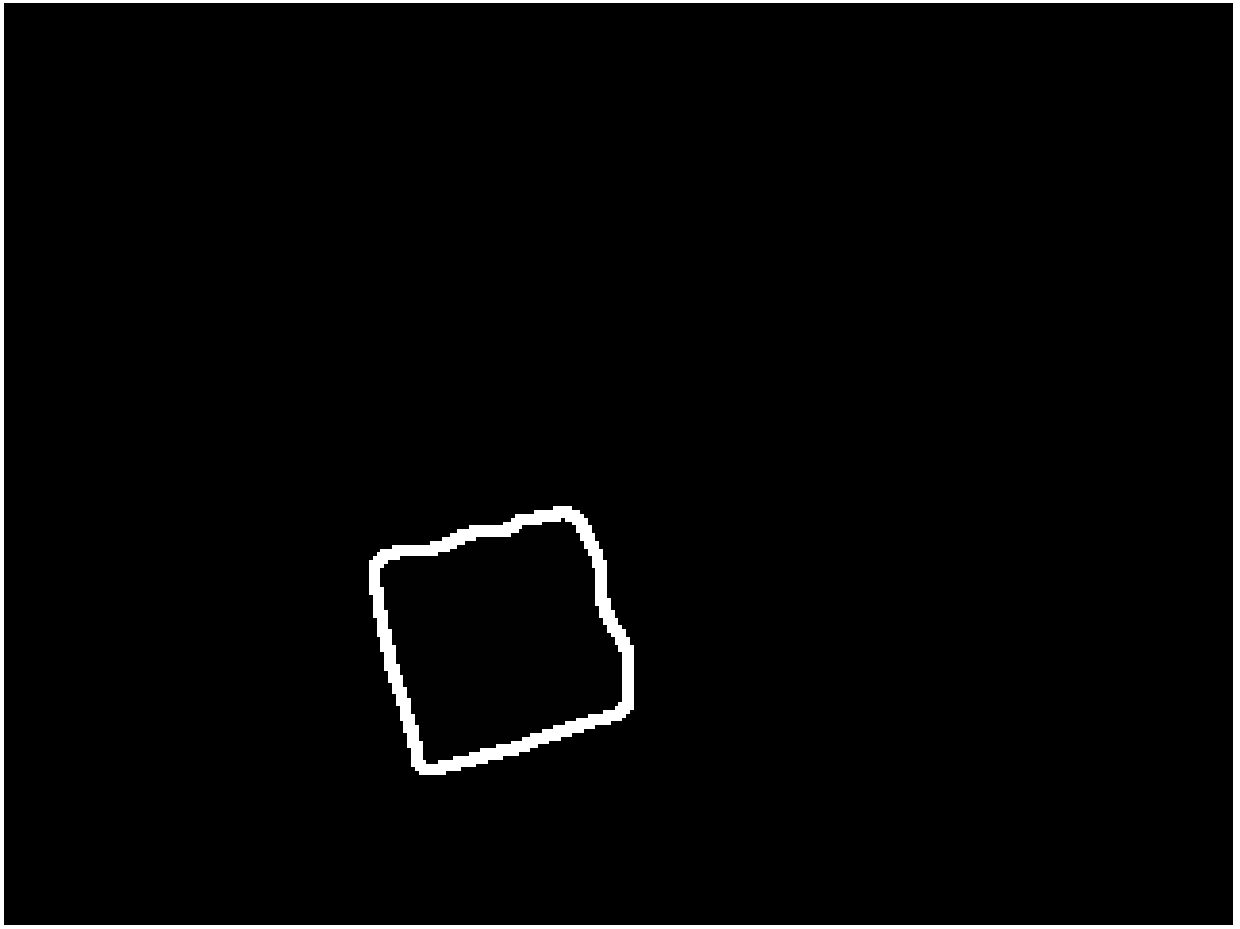
(Imgproc/cvtColor src dest Imgproc/COLOR_BGR2HSV)



(Core/inRange src low high dest)



(Imgproc/findContours img result (Mat.)
Imgproc/RETR_EXTERNAL
Imgproc/CHAIN_APPROX_SIMPLE)



Summary

- Powerful, but very imperative style
  - wrapper functions make it more palatable
- Demo code & wrappers:
  https://github.com/davesnowdon/cljex-2015-opencv
- Vision library probably worth a look
  - http://nakkaya.com/vision.html
- See also
  - http://opencv.org/documentation.html
  - http://www.pyimagesearch.com/

Demo functions

https://github.com/davesnowdon/cljex-2015-opencv

```
(def img (read-image “filename.jpg”))

(write-image “filename.png” img)

(show-line img)

(is-image-blurry img)

(show-faces-and-eyes img)

(def low-value (Scalar. hue saturation  value))
(def high-value (Scalar. hue saturation value))
(show-blob img low-value high-value)
```