

1 TODO

- (29.01.) Compare CUDA vs. VIGRA vs. ArrayFire in C++
- (08.02.) Implement arrayfire hessianofgaussian or stensor (C++ or python)
- (02.02.) Checkout OpenCV CUDA/OpenCL performance
- (29.01.) Implement CUDA c++ gaussian (ignore padding)
- DONE: (08.02.) Compare python vigra, opencv, arrayfire
- DONE: (03.02.) Investigate data movement in ArrayFire (see af usergroup post)
- DONE: (29.01.) Implement ArrayFire c++ gaussian (ignore padding)
- DONE: (29.01.) Implement VIGRA c++ gaussian (ignore padding)

2 Current setup

2.1 `vigra.filters.gaussianSmoothing(img, sigma)`

- separated x-,y- convolution
- kernel is initialized from scratch for every call
- kernel element: $k[i] = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{i^2}{2\sigma^2}}$
- kernel radius: $r = \text{round}(3 * \sigma)$

2.2 `vigra.filters.laplacianOfGaussian(img, sigma)`

2.3 `vigra.filters.gaussianGradientMagnitude(img, sigma)`

2.4 `vigra.filters.gaussianSmoothing(img, sigma)` - `vigra.filters.gaussianSmoothing(img, 0.66*sigma)`

2.5 `vigra.filters.structureTensorEigenvalues(img, sigma, sigma/2.0)`

2.6 `vigra.filters.hessianOfGaussianEigenvalues(img, sigma)`

3 HiWi HCI Notes

3.1 09.02.2016 (h)

- bigheron ip: 192.168.128.14

3.2 08.02.2016 (4h)

- ran python comparison, approx arrayfire speed up of 10, approx opencv speed up of 2
- Sizes range from 256x256 to 10000x10000
- single image convolution is important, yet batching copy operations might be possible

3.3 02.02.2016 (2h)

Worked on arrayfire c++ implementation. Set up vigra and such on personal notebook.

3.4 02.02.2016 (1.5h)

3.4.1 OpenCV

- CUDA support
- http://docs.opencv.org/3.0.0/d4/d25/classcv_1_1cuda_1_1Convolution.html
- Comparison OpenCV vs. ArrayFire (LibJacket) <http://mcclanahoochie.com/blog/2011/09/opencv-vs-libjacket-gpu-sobel-filtering/>

3.5 29.01.2016 (9:30 - 12:00, 12:30 - 14:30, 4.5h)

3.5.1 ArrayFire

- handles 1D,2D,3D convolutions
- allows batch processing (1 Kernel, n images or n Kernels, 1 image and so on)
- Does it separate Kernels?
- Example: http://www.arrayfire.com/docs/getting_started_2convolve_8cpp-example.htm

3.5.2 Talked to Sven

- ArrayFire
- nexts steps (see todo)
- received Michaela's code

3.5.3 Commands

Show vigra compiler options

```
# vigra-config --cpp-flags --libs
```

3.6 26.01.2016 (3h)

Base on CUDA samples. separableConvolution and textureConvolution are already implemented.

3.6.1 snippets

Listing 1: "print out gaussian 1D kernel"

```
import vigra

sigma = 3

kernel = vigra.filters.Kernel1D()
kernel.initGaussian(sigma)

for i in range(kernel.left(), kernel.right()+1):
    print kernel[i]
```

3.6.2 Addresses

- bigheron - GPU system
- hciwiki.iwr.uni-heidelberg.de

3.7 22.01.2016 (3h)

3.7.1 Ideas

- Vigna efficiency improvements
- CUDA/OpenCL (CUDA samples!)
- OpenGL
- FFT approach

3.7.2 Commands

```
# source miniconda2/bin/activate ilastik-devel
# source miniconda2/bin/activate root
# conda create -n ilastik-devel -c ilastik ilastik-everything-but-tracking
```