Stochastic Localization Microscopy (STORM)

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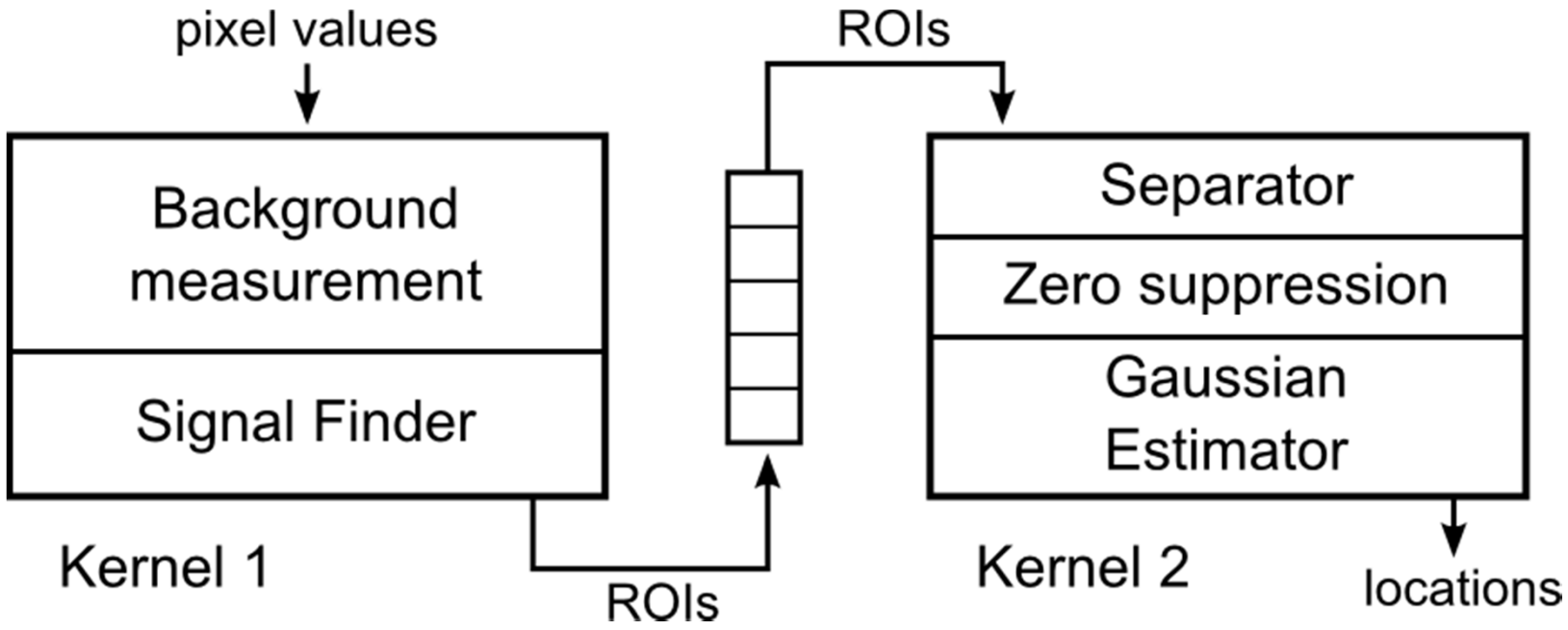
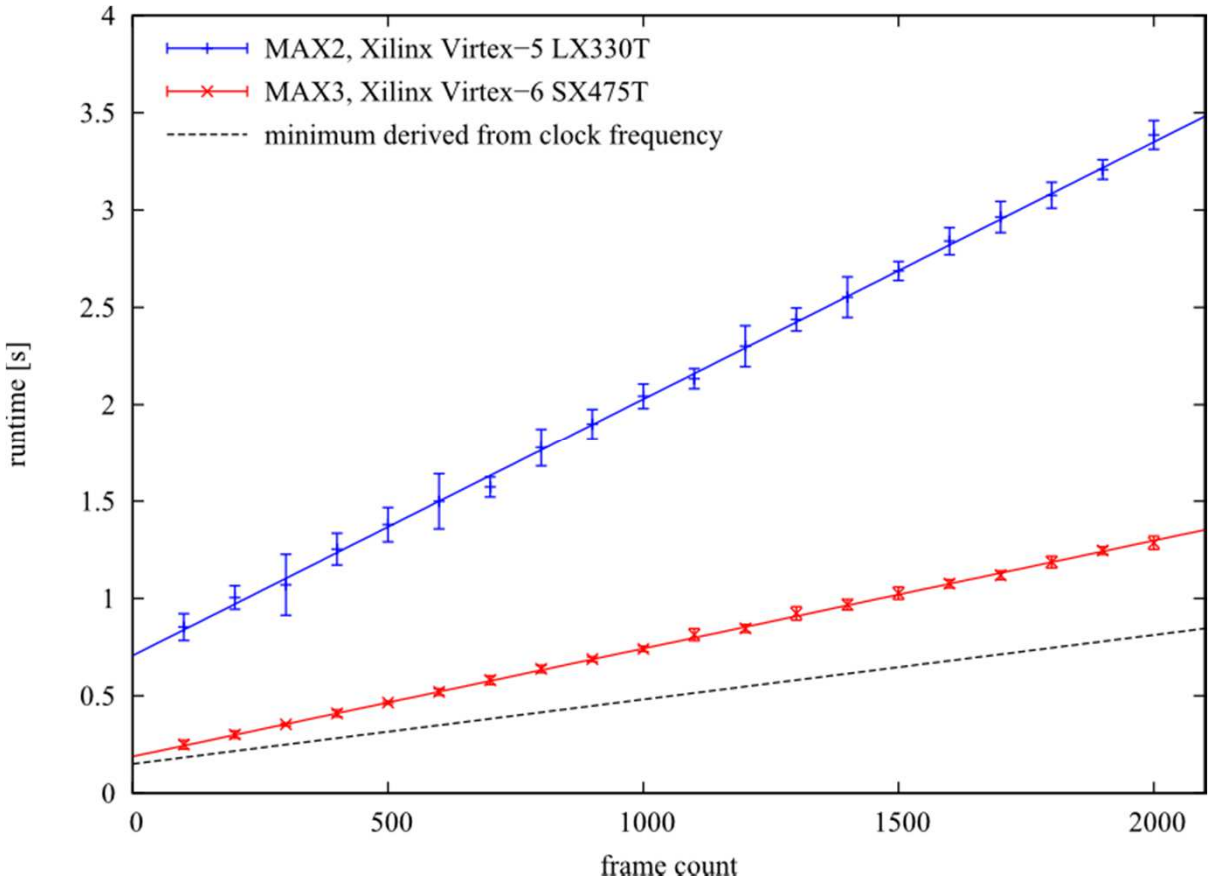
Implementation on Max3 DFE



Two kernels with 200MHz each.
Kernel 1 processes one input pixel per cycle.

Throughput



- MAX2: 70 Mpx/s (Xilinx Virtex-5 LX330T), 200 MHz
- MAX3: 167 Mpx/s (Xilinx Virtex-6 SX475T), 200 MHz

Acceleration

Typical image with 329,444 signals

Intel i5 450:
Iterative signal fitting

[Intel]

4h

x100

Intel i5: New algorithm with
center-of-mass calculation

[Intel]

1min 20s

x180

Max3
Dataflow design

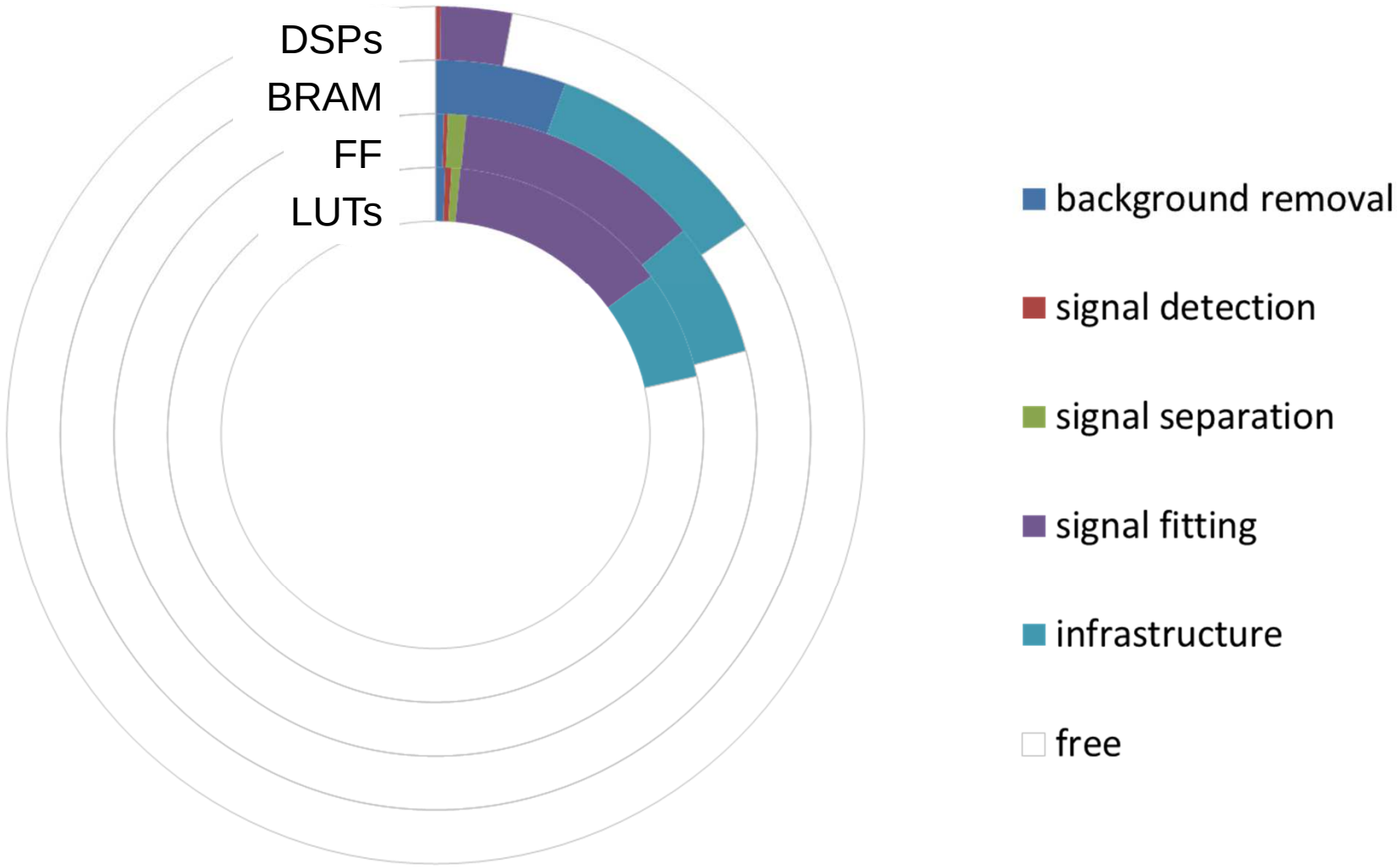
0.8s

See also:

Gruell, Kirchgessner, Kaufmann, Hausmann, Kebschull:
Accelerating Image Analysis For Localization Microscopy With FPGAs, FPL 2011;

Kaufmann, Piontek, Grüll, Kirchgessner, Rossa, Wolburg, Blasig, Cremer:
Visualization and Quantitative Analysis of Reconstituted Tight Junctions Using Localization Microscopy,
PLoS ONE, vol. 7, Public Library of Science, 2012

Ressource usage



MAX3 (Xilinx Virtex-5 LX330T), 200MHz

Resource usage

MAX3 (Xilinx Virtex-5 LX330T)

component	**LUTs**	**FFs**	**BRAMs**	**DSPs**
background	1151	1242	120	0
spot finding	741	609	0	4
spot separation	1038	2721	0	0
feature extraction	26470	37127	0	54
total usage	42464	61884	330	58
available	297600	297600	2128	2016
total %	14%	21%	16%	3%

occupies < 1/5 of a Xilinx Virtex-6 SX475T FPGA