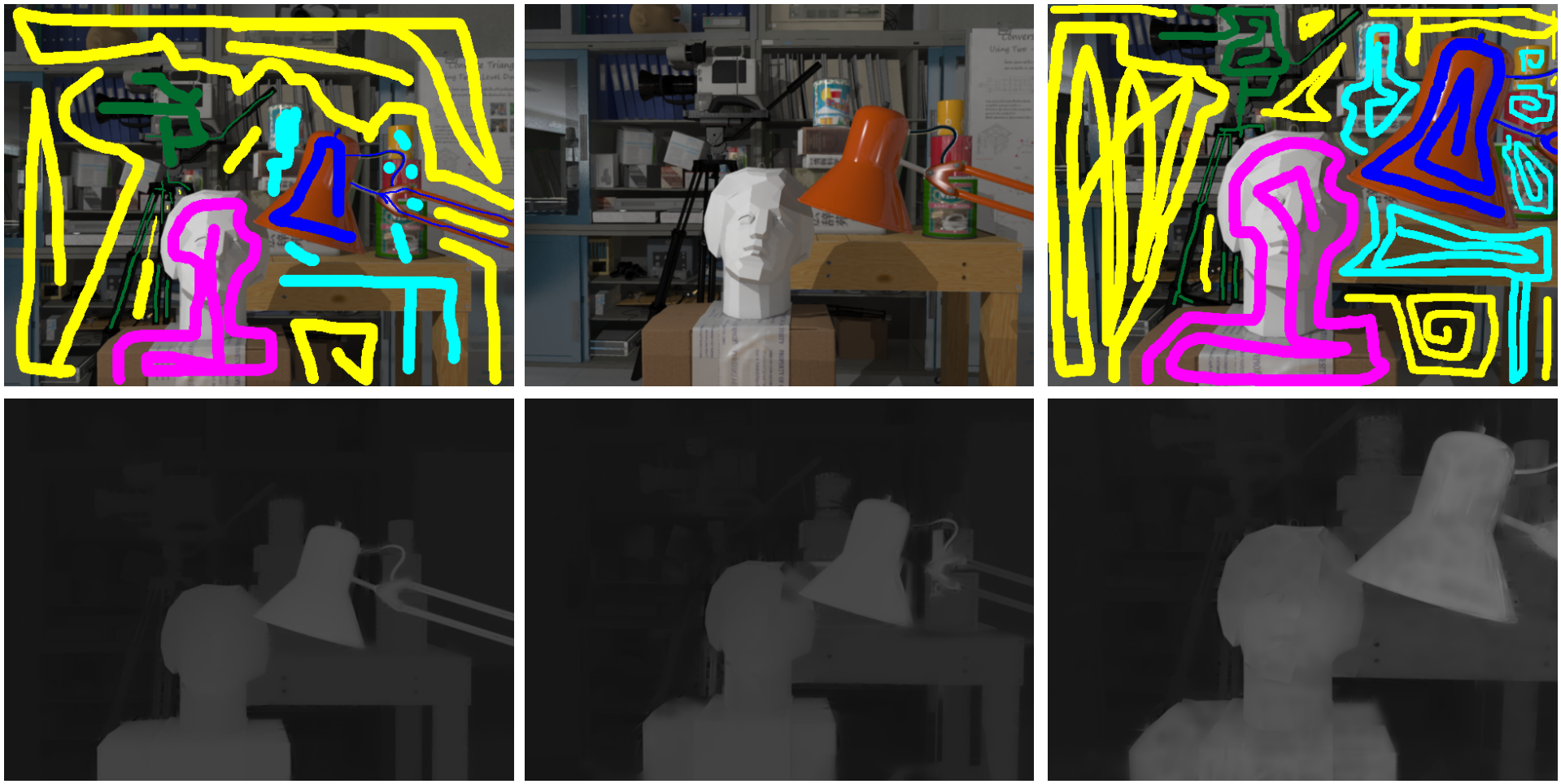
Supplementary Material

Efficient Depth Propagation in Videos with GPU-acceleration

Frame 1 Frame 30 Frame 100



Example result of proposed 2D-to-3D conversion (*Tsukuba1*).

Top: Input video and user input; The depth scribbles in frame 1 and frame 100 are color coded.

Bottom: 2D-to-3D conversion result.

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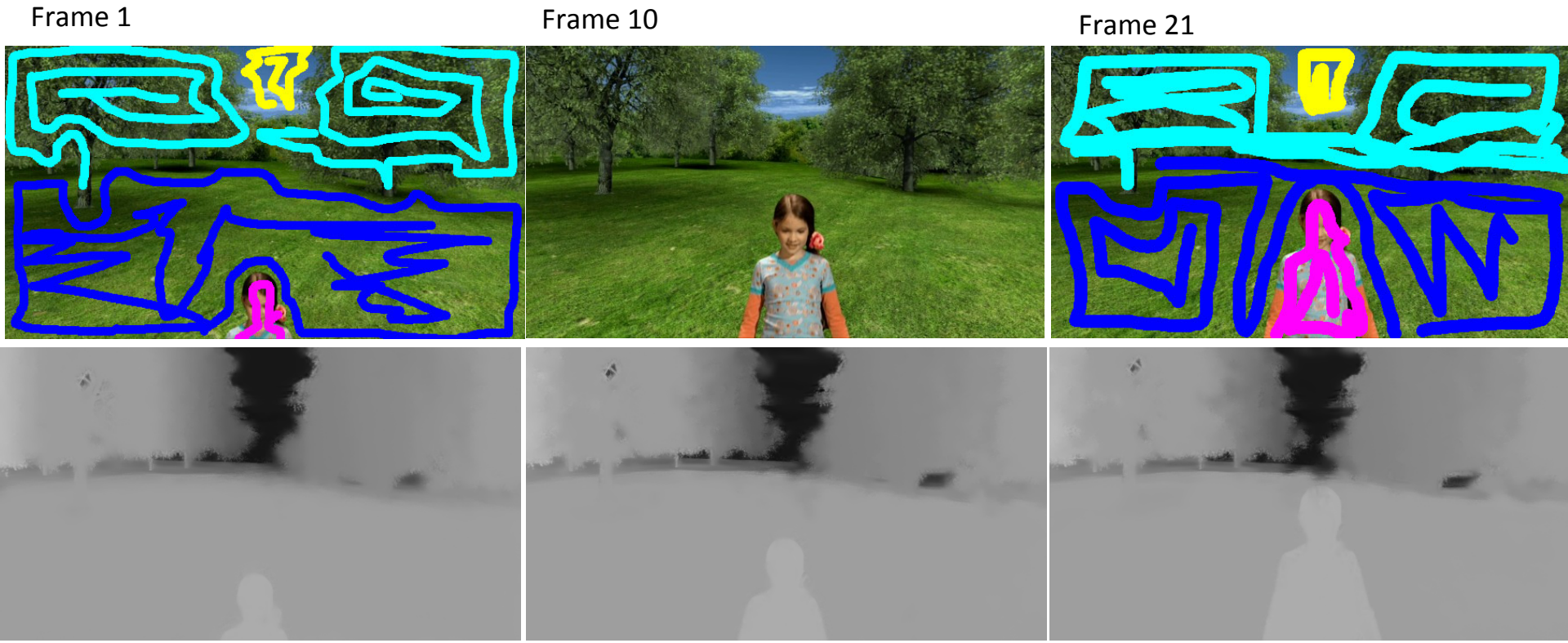

Example result of proposed 2D-to-3D conversion (*Child*).

Top: Input video and user input; The depth scribbles in frame 1 and frame 21 are color coded.

Bottom: 2D-to-3D conversion result.

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Video / MSE	[1] with OF	[1] without OF	[4]	**Ours, with OF**	**Ours, without OF**
Palace	1.01	1.39	8.51	**0.17**	**0.17**
Parade	0.23	0.23	6.87	**0.12**	**0.13**
City	0.32	0.56	10.30	**0.08**	**0.09**
Football	0.23	0.33	4.95	**0.08**	**0.10**
Stairs	0.19	0.31	1.56	**0.12**	**0.12**

Quantitative evaluation and comparison to [1] and [4].

*MSE*s (mean squared errors) are averaged over all frames and multiplied by 100. Results for [1] and [4] are taken from [1]. For this evaluation the same video, user-input and disparities as in [1] were used to generate resulting disparity maps. For the not optimized algorithm, i.e., [1], and our optimization the results for the algorithm with and without usage of optical flow (*OF*) are listed. All tested algorithms use the same method to estimate the used OF fields, which makes the evaluation independent of the quality of the performed motion estimation.

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Video / Runtime	Resolution	Not optimized [1] (C++)	**Our optimization of [1]** (CUDA)
City	699 x 232 x 19	440	**12**
Parade	689 x 282 x 11	286	**7**
Palace	702 x 278 x 10	267	**7**
Stairs	702 x 279 x 10	590	**12**
Football	669 x 282 x 20	974	**27**
Child	600 x 338 x 21	530	**28**
Tsukuba50	640 x 480 x 17	729	**15**
Tsukuba380	640 x 480 x 18	705	**16**

Computational efficiency evaluation of the joint segmentation and propagation step in the un-optimized [1] and our optimized 2D-to-3D conversion algorithm.

The table lists the runtimes in seconds. In this comparison, the joint segmentation and propagation step of the un-optimized and our optimized algorithm take the same input videos, user-input, disparities and parameters.

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Efficient Depth Propagation in Videos with GPU-acceleration

Video / Runtime	Video resolution	**Our optimized approach** (CUDA)	Approach from [1] (CUDA)
City	699 x 232 x 19	**0.62**	1.36
Parade	689 x 282 x 11	**0.14**	0.36
Palace	702 x 278 x 10	**0.13**	0.34
Stairs	702 x 279 x 10	**0.22**	0.75
Football	669 x 282 x 20	**0.44**	1.70
Child	600 x 338 x 21	**1.06**	2.15
Tsukuba50	640 x 480 x 17	**0.27**	1.11
Tsukuba380	640 x 480 x 18	**0.36**	1.12

Computational efficiency evaluation of region-wise filtering (i.e., regularization step) in the un-optimized [1] and our optimized 2D-to-3D conversion algorithm.

The table lists the runtime in seconds. To emphasize the algorithmic contribution in this optimization, both region-wise filtering approaches were implemented in CUDA. In [1] each region is filtered in a separate filtering step. Contrary, our approach filters all regions separately but in a single filtering step. Both approaches applied on the same videos and number of regions.

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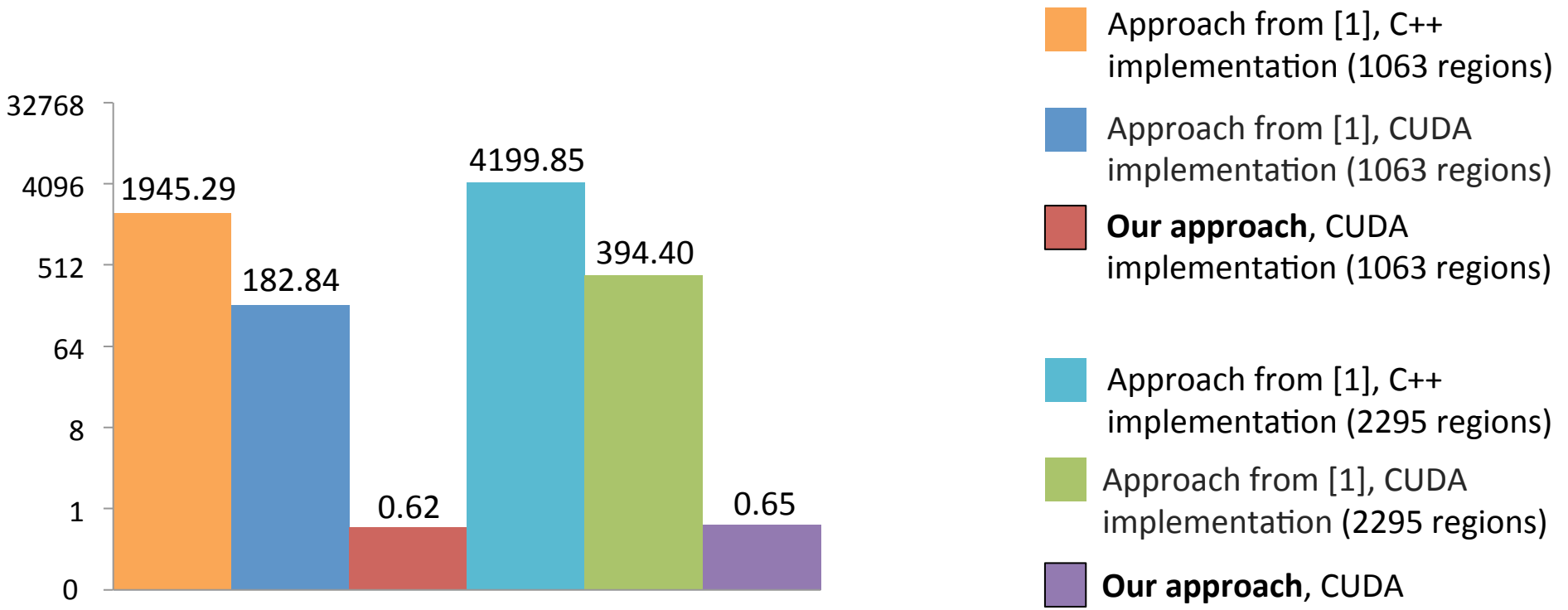

Runtime of different region-wise filter implementations in seconds.

Computational efficiency evaluation of region-wise filtering (i.e., regularization step).
Comparison of runtimes between the C++ and CUDA implementation of the initial region-wise filtering approach from [1] (i.e., each region is filtered in a separate filtering step) and our CUDA implementation of our region-wise filtering (i.e., all regions are separately filtered in one filtering step). The comparison is performed for a segmentation into 1063 and into 2295 regions. The chart lists the runtime of different implementations in seconds for a video with a resolution of 600 x 255 x 20 pixel.

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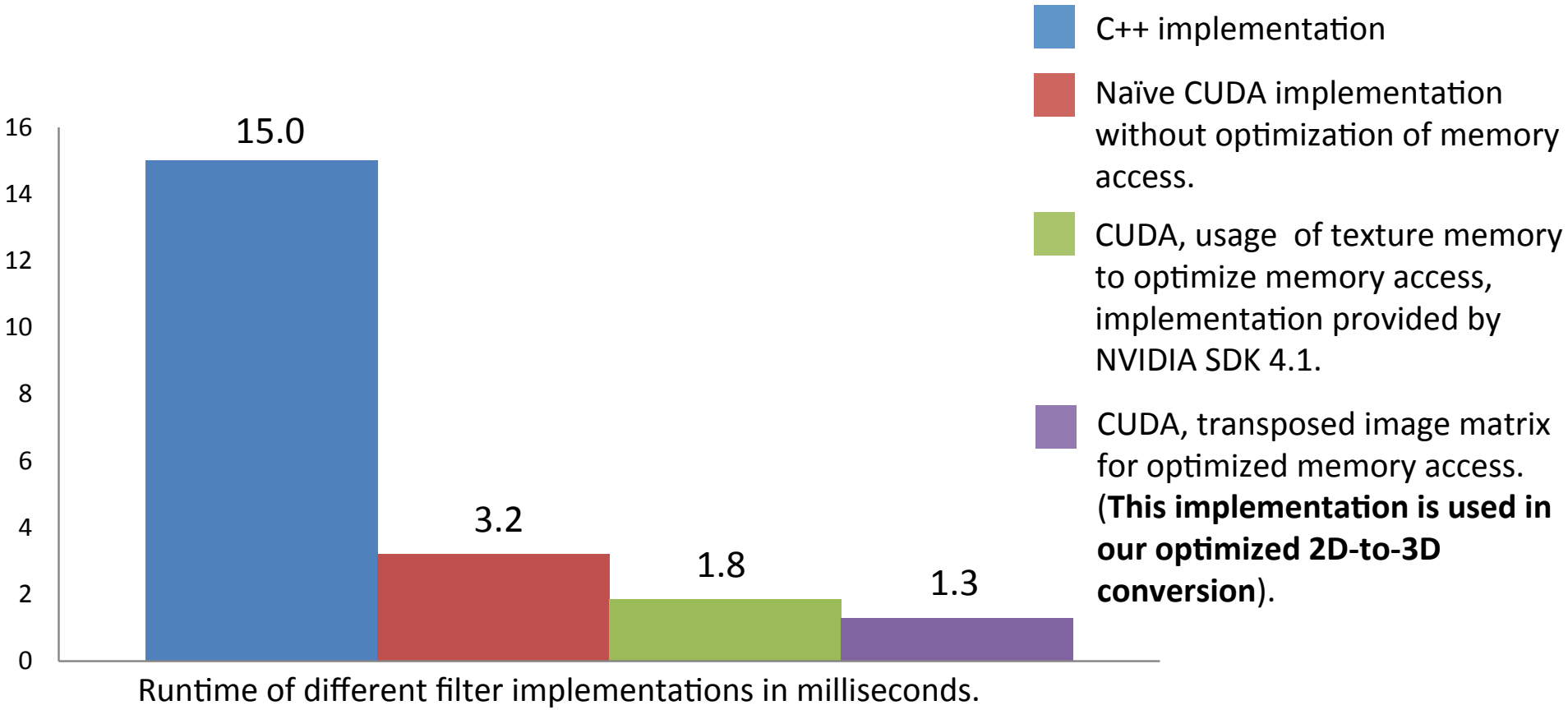

Runtime of different filter implementations in milliseconds.

Computational efficiency evaluation of different box filter implementations in CUDA, which is used in the regularization step (i.e., guided filtering) of the 2D-to-3D conversion algorithm.

The chart lists the runtime of different implementations in milliseconds for an image with a resolution of 1024 x 1024 pixel. Note that the guided filter, which is used in the interpolation step of the 2D-to-3D conversion algorithm, is implemented as a series of box filters. Thus, it is vital to efficiently implementation of a box filter to optimize the 2D-to-3D conversion algorithm from [1].