AN EFFECTIVE SHARPNESS ASSESSMENT METHOD FOR SHALLOW DEPTH-OF-FIELD IMAGES

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Field: No-Reference(NR) Image Sharpness Assessment

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Background information

The sharpness of an image determines the amount of detail that an imaging system can present, and it is one of the most significant factors affecting the quality of an image. No-reference(NR) image sharpness assessment metrics have been proposed.

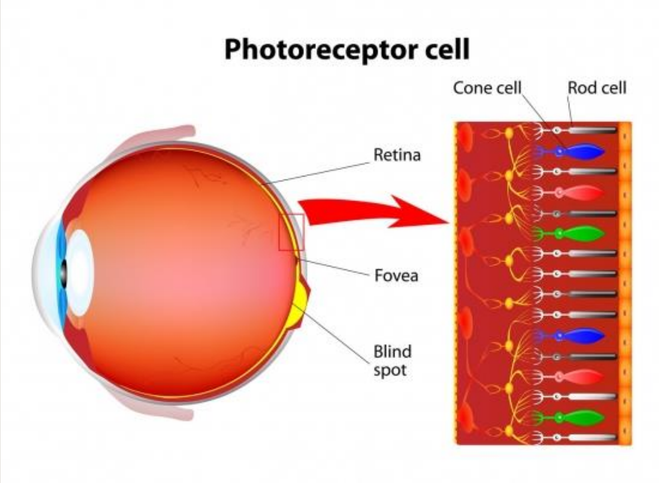
Sharpness of the shallow depth-of-field images?

Background information

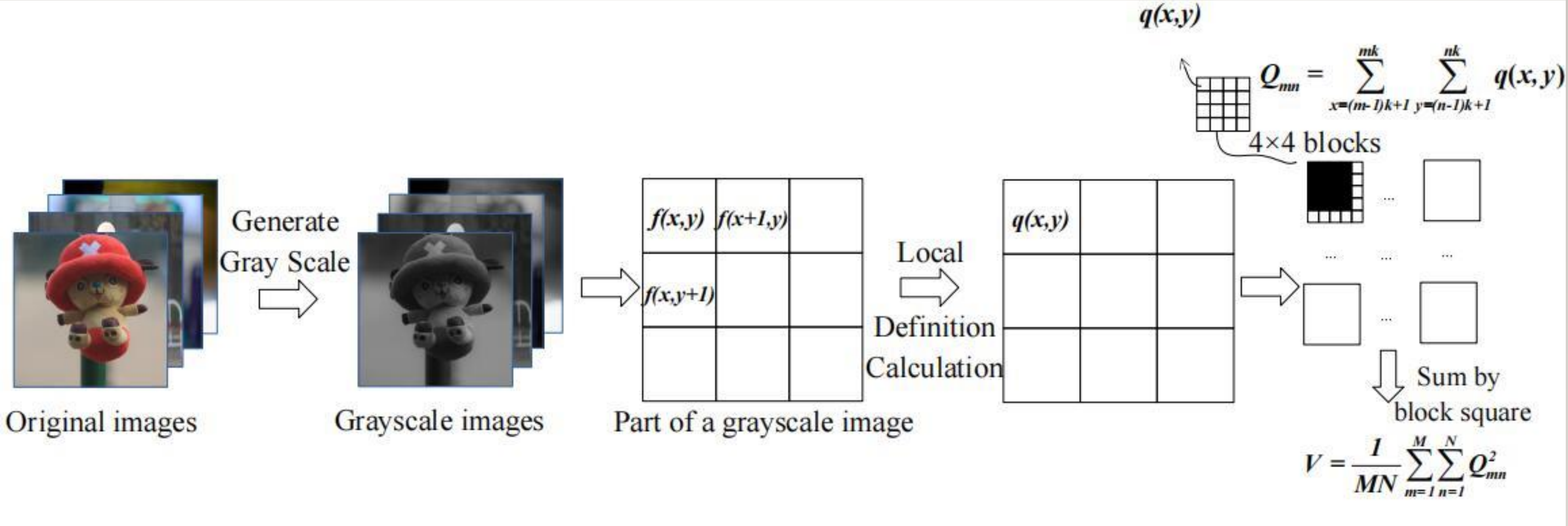
However, our recent studies show that state-of-art sharpness assessment indicators may misjudge the degree of sharpness for image with shallow depth of field that are often used to highlight the main subject in the view.

Innovation and presentation

Inspired by the characteristics that the clear areas of shallow depth-of-field images have greater contributions to human vision, we design a novel technique for image sharpness assessment based on the block energy variation and the energy variation around pixels in our paper.

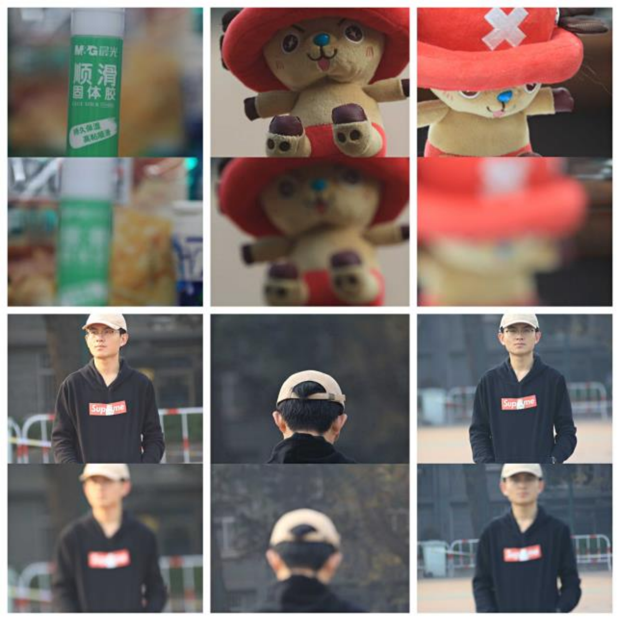


Innovation and presentation



The main work

Experiment A



Metric	Algorithm failure times
Proposed Metric	0
Laplacian	7
CPBD [3]	7
Variance	6
MLV [5]	1
CurveletQA [7]	4
BRISQUE [4]	8
NIQE [12]	2
SSEQ [8]	12
Maxpol1 [11]	1
Maxpol2 [11]	1

The main work

Experiment B

Six blur types of images are chosen: among which Gaussian blur, JPEG compression, and JPEG2000 compression all appear in LIVE, TID2008 and TID2013, Denoising in TID2008 and TID2013, Chromatic aberrations and Sparse sampling and reconstruction in TID2013.

Blur Type	Metric / DB	Criterion	Proposed Metric	CPBD [3]	MLV [5]	Curvelet QA[7]	BRISQUE [4]	NIQE [12]	SSEQ [8]	Maxpol1 [11]	Maxpol2 [11]
Gaussian blur	Tid2008	PLCC	**0.9258**	0.9008	0.9224	0.9056	0.6804	0.9248	0.9114	0.9246	0.9166
		SROCC	0.9114	0.8975	0.9075	**0.9250**	0.8290	0.9180	0.9073	0.9130	0.9170
	Tid2013	PLCC	**0.9339**	0.9012	0.9338	0.8688	0.7155	0.8507	0.8841	0.9034	0.8887
		SROCC	**0.9423**	0.8918	0.9200	0.8930	0.8010	0.8660	0.8860	0.8930	0.9030
	Live	PLCC	**0.9529**	0.9383	0.9506	0.8987	0.7831	0.9392	0.9422	0.9357	0.9360
		SROCC	0.9579	**0.9590**	0.9390	0.9301	0.9312	0.9317	0.9514	0.9509	0.9065
JPEG compression	Tid2008	PLCC	**0.9514**	0.3146	0.9446	0.8293	0.9384	0.9412	0.8564	0.4846	0.6265
		SROCC	0.9206	0.2946	0.9122	0.8880	0.9130	**0.9210**	0.8530	0.2852	0.6630
	Tid2013	PLCC	0.9392	0.4885	**0.9395**	0.9256	0.9327	0.9325	0.855	0.5314	0.7033
		SROCC	0.9139	0.4994	0.9016	0.8790	0.9010	**0.9220**	0.839	0.3715	0.7110
	Live	PLCC	0.9199	0.0538	0.8916	0.8192	**0.9295**	0.9008	0.9144	0.4989	0.4645
		SROCC	0.8792	0.0493	0.8595	0.8059	**0.8863**	0.8812	0.8723	0.3070	0.2054
JPEG2000 compression	Tid2008	PLCC	**0.9307**	0.9206	0.9224	0.7726	0.7961	0.8276	0.8380	0.5989	0.6750
		SROCC	**0.8947**	0.8621	0.8751	0.7480	0.7860	0.8260	0.8290	0.4610	0.6160
	Tid2013	PLCC	**0.9571**	0.9435	0.9500	0.8361	0.7849	0.8617	0.8931	0.6387	0.6958
		SROCC	**0.9353**	0.8937	0.9132	0.8000	0.8470	0.8750	0.8890	0.4860	0.6290
	Live	PLCC	0.9005	0.9024	0.8975	0.8243	**0.9155**	0.9152	0.8941	0.5290	0.5737
		SROCC	0.8872	0.8920	0.8824	0.8235	0.8902	**0.9022**	0.8881	0.4304	0.6128
Denoising	Tid2008	PLCC	**0.9530**	0.8443	0.9401	0.9095	0.7750	0.8219	0.9482	0.6658	0.9119
		SROCC	**0.9397**	0.8660	0.8881	0.886	0.7350	0.7850	0.8970	0.6050	0.8440
	Tid2013	PLCC	**0.9510**	0.8654	0.9443	0.9049	0.7565	0.7925	0.8996	0.4779	0.8682
		SROCC	**0.9299**	0.8724	0.9219	0.8240	0.7610	0.7660	0.8620	0.3210	0.8220
Chromatic aberrations	Tid2013	PLCC	**0.9731**	0.8857	0.9717	0.7867	0.7611	0.8344	0.7768	0.6984	0.8605
		SROCC	**0.9066**	0.8130	0.8688	0.7720	0.7450	0.6550	0.8010	0.5640	0.7190
Sparse sampling and reconstruction	Tid2013	PLCC	0.9527	0.8715	**0.9568**	0.8260	0.8055	0.8307	0.8769	0.7822	0.8631
		SROCC	**0.9532**	0.8414	0.9330	0.8410	0.7200	0.8480	0.9160	0.6860	0.8110

Conclusions

The newly proposed algorithm obtains more accurate identification results when evaluating the shallow depth-of-field images. And the newly proposed algorithm shows competitive results over the traditional ones on three public image datasets as well.

Thanks for listening!