Multispectral Demosaicking with Novel Guide Image Generation and Residual Interpolation

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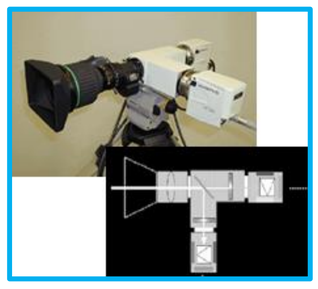
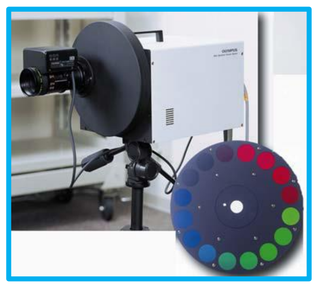
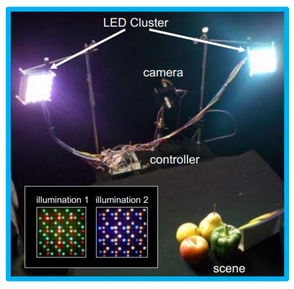
Introduction

- Multispectral imaging has received increasing attention in many image processing fields.
- Existing multispectral imaging systems still have limitations in size, cost, etc.


Multi-camera system


Multi-shot system

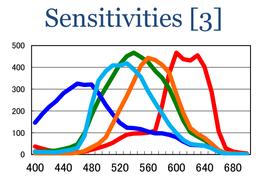


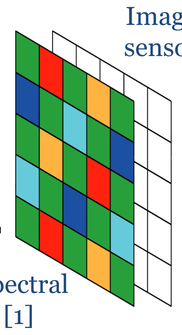
Active lighting system

Our developed System

- We developed a **"practical"** one-shot multispectral imaging system.
- It works in **"real-time"** and has potential for many applications[9].

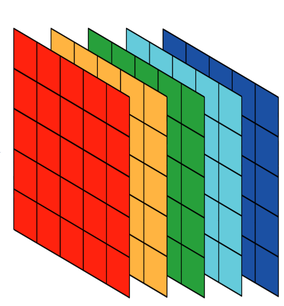

Our multispectral camera prototype





Our developed multispectral filter array (MSFA) [1]

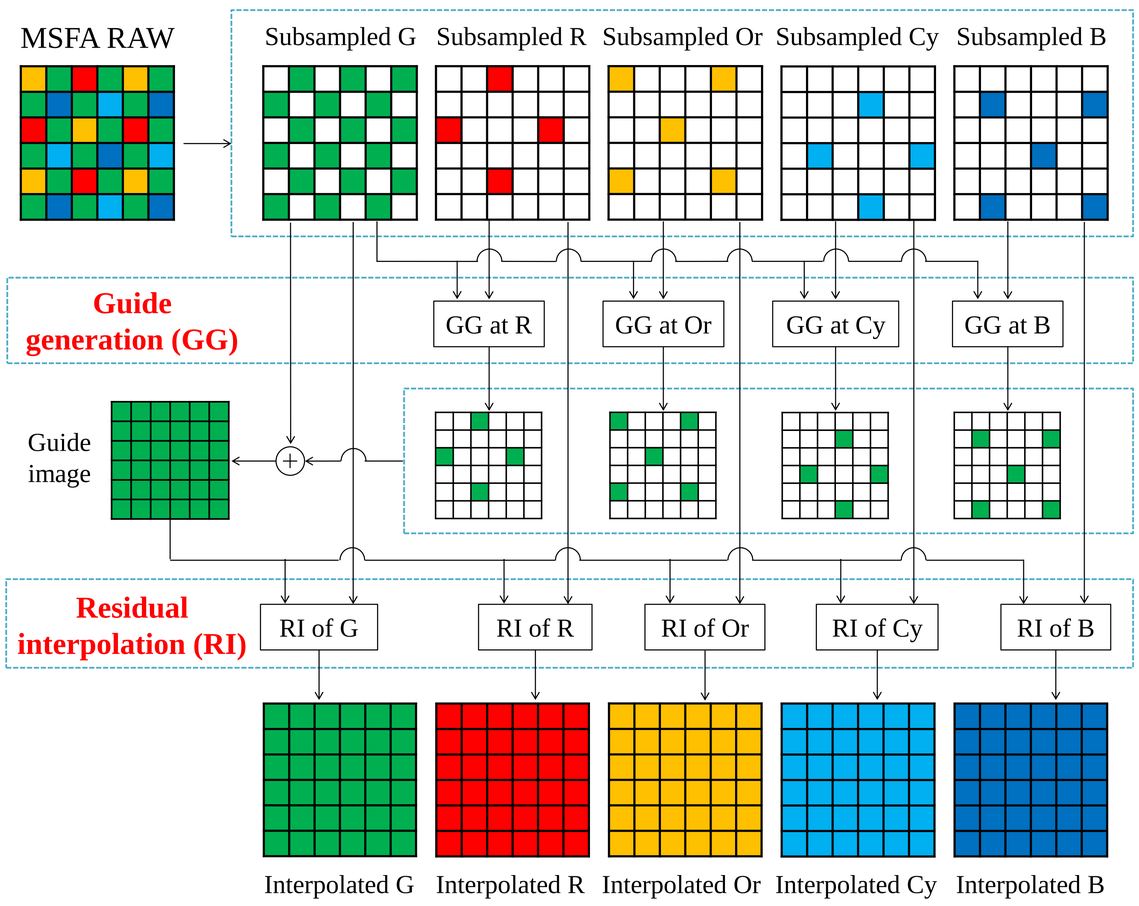
Our developed demosaicking [2]


Multispectral image (5-band)

In this paper, we improved the demosaicking performance!

Proposed Algorithm

- We improved our previous algorithm[2] in the two points.

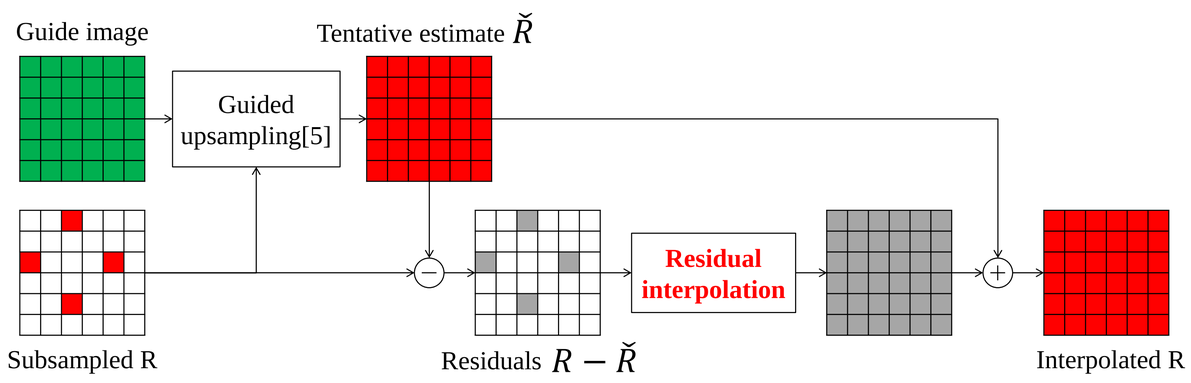


1. Novel Guide Image Generation

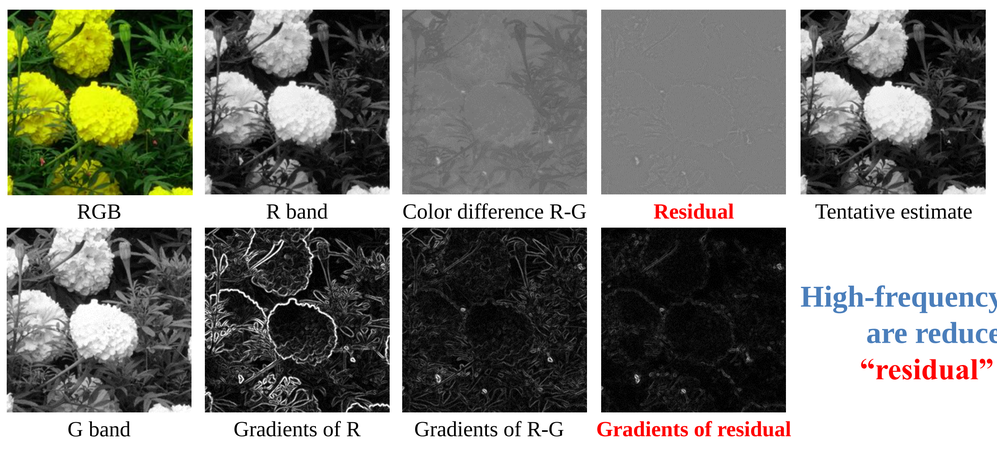
- We exploit multispectral correlations for effectively generating the guide image.

2. Residual Interpolation

- We extend our proposed residual interpolation (Kiku et. al. [4]) for multispectral demosaicking.



- We perform the interpolation in the residual domain.



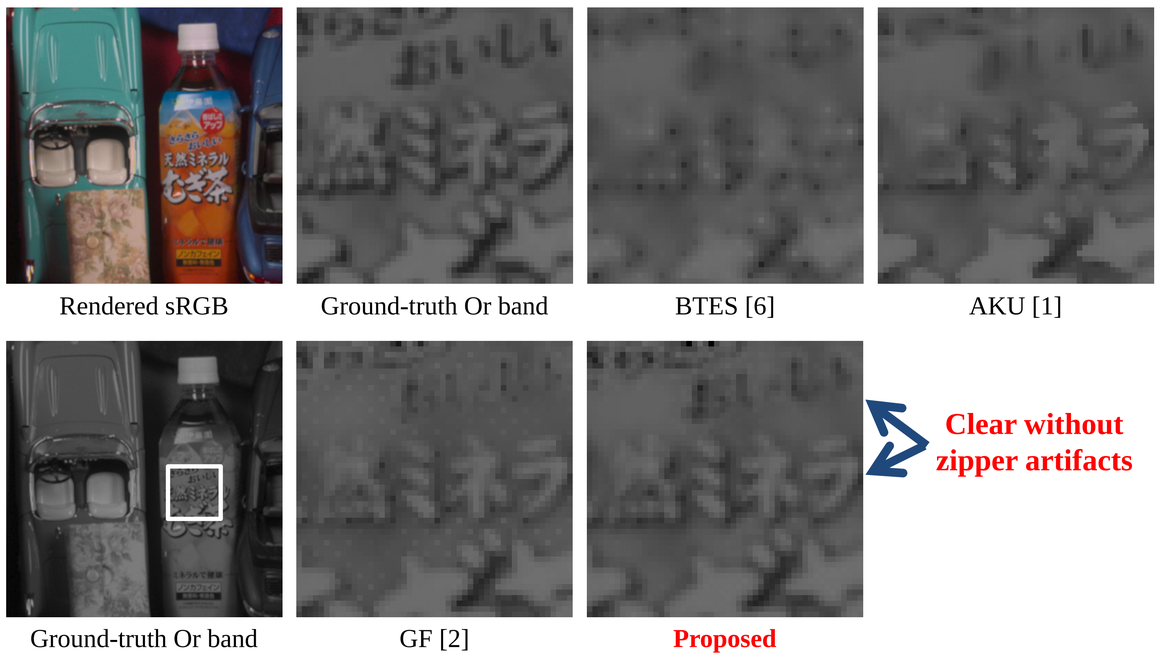
High-frequency components are reduced in the "residual" domain.

Experimental Results

Dataset

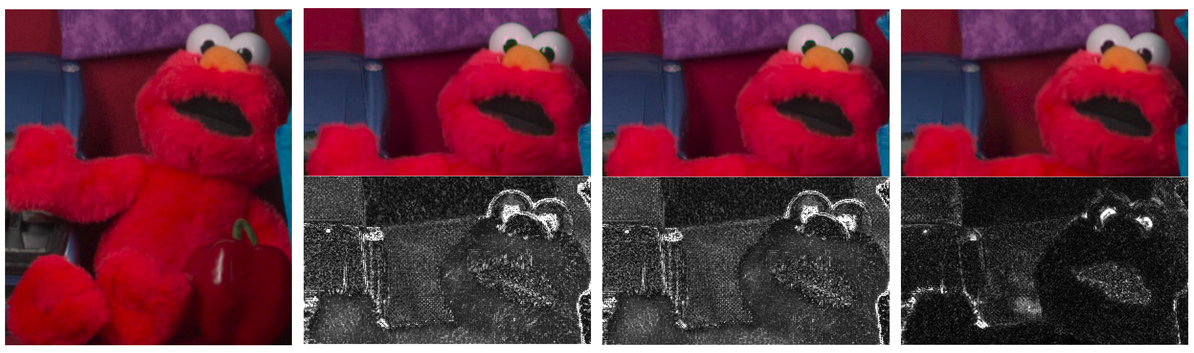
- We captured ground-truth 5-band images of 16 scenes.

1. Comparison with existing and our previous algorithms



2. Comparison with existing 3-band Bayer algorithms

- Evaluation is performed in the sRGB domain.



3. Numerical performance (average of 16 scenes)

	Algo.	PSNR								CIEDE 2000
		R	Or	G	Cy	B	sR	sG	sB	
3band	GBTF [7]	NA	NA	NA	NA	NA	29.52	39.44	35.35	4.00
	LPA [8]	NA	NA	NA	NA	NA	30.39	41.24	36.71	3.68
5band	BTES [6]	49.38	45.00	48.60	42.78	44.93	34.46	42.95	36.36	2.91
	AKU [1]	52.19	47.80	48.78	45.38	48.06	38.14	44.20	39.53	2.34
	GF [2]	53.12	51.06	49.61	47.94	48.89	40.75	45.73	40.51	2.06
	Proposed	**54.93**	**52.31**	**51.08**	**49.42**	**49.86**	**42.49**	**47.19**	**41.26**	**1.88**

References

Project page: http://www.ok.ctrl.titech.ac.jp/res/MSI/MSI_e.html

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