Multispectral Fusion of RGB and NIR Images Using Weighted Least Squares and Alternating Guidance

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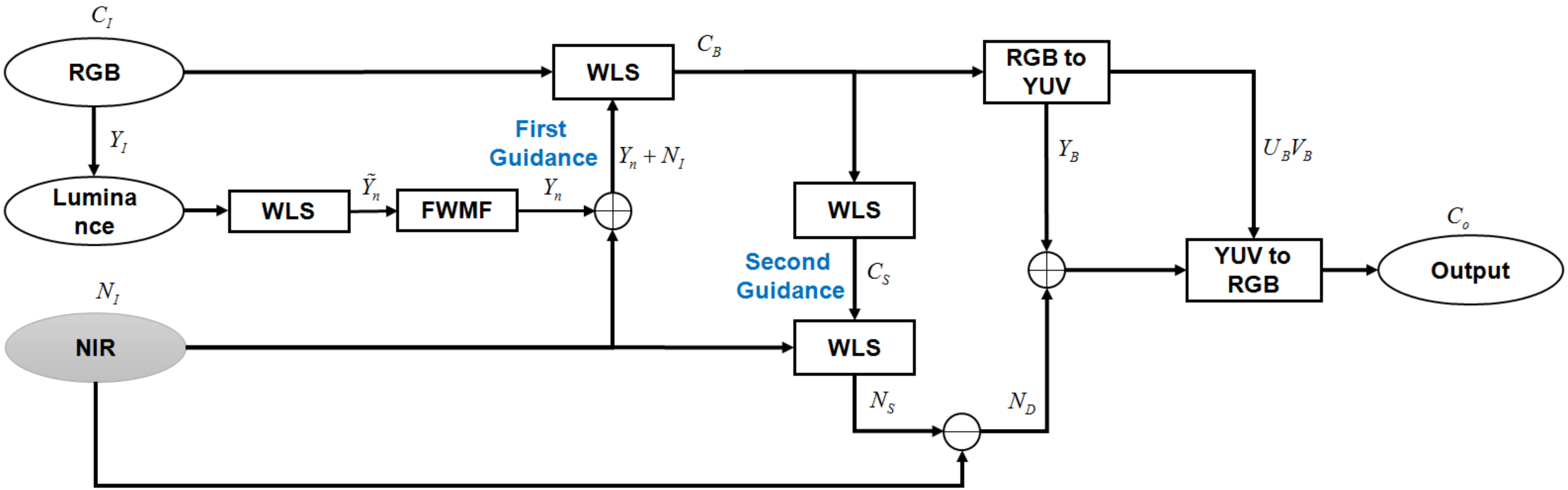
Introduction

In low light condition, **color (RGB)** images captured by camera contain **much noise** and **loss of details**. However, **near infrared (NIR)** images are **robust to noise** and have **clear textures without color**. In this paper, we propose multispectral fusion of RGB and NIR images with **weighted least squares (WLS)** and **alternating guidance**. Low light RGB images provide big-scale image structure and color information, while NIR images offer clear textures. We maximize the advantage of multimodal input (RGB and NIR) for fusion based on alternating guidance.

(a) (b)

Framework



WLS: Weighted least squares. FWMF: Fast weighted median filtering. ⊕: Pixel-wise addition operator. : Pixel-wise subtraction operator

First Guidance for Noisy RGB Denoising

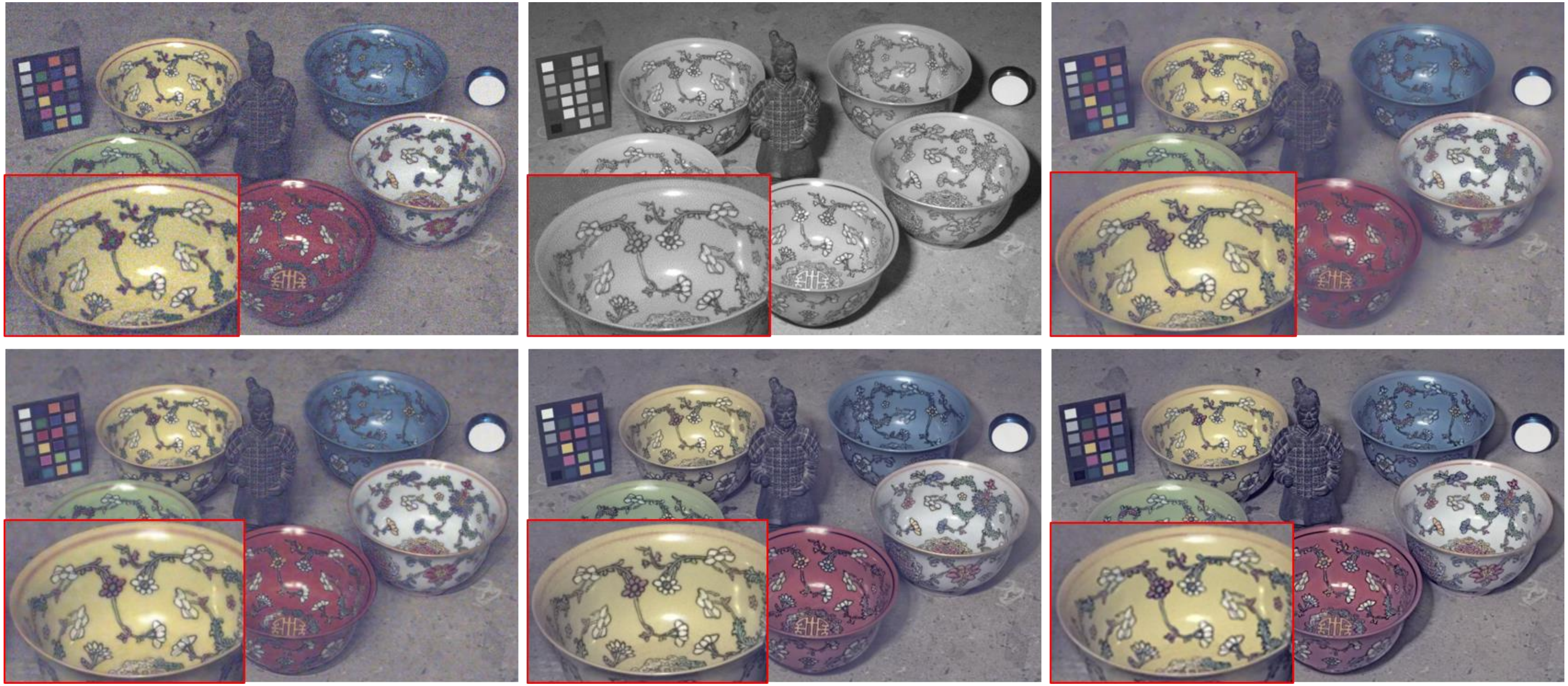
RGB denoising comparison by the first guidance. Top-left: Noisy RGB image. Top-right: Guided by CI with small denoising coefficient. Bottomleft: Guided by CI with big denoising coefficient. Bottom-right: Guided by Yn + NI.

Second Guidance for Detail Transfer

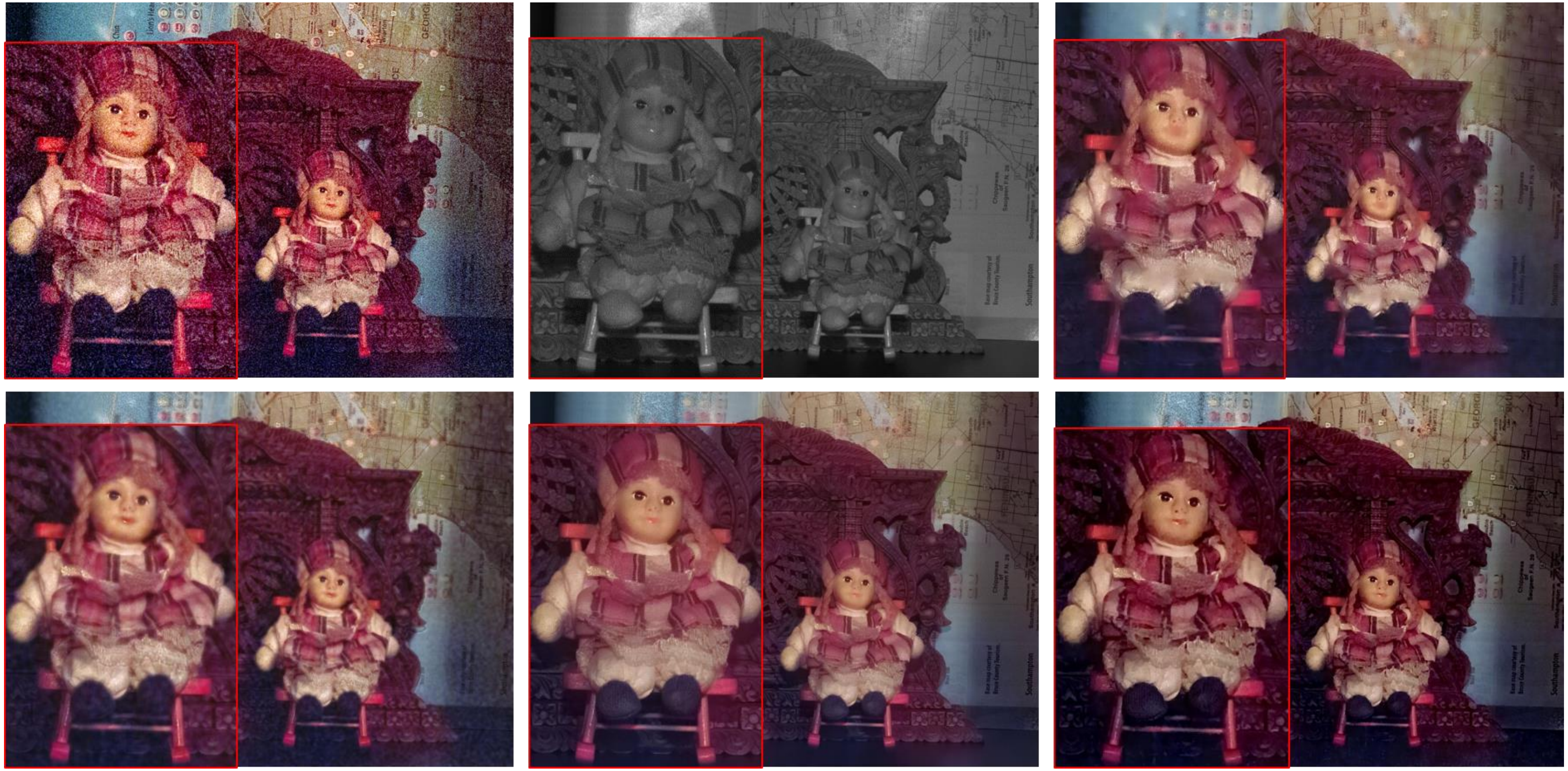
Second guidance Cs

(a) Input NIR (top) and RGB (down) images. (b) Detail transfer guided by small scale NIR smoothing. (c) Detail transfer guided by large scale NIR smoothing. (d) Proposed method guided by *CS*.

Experimental Results



Top: Input RGB image, input NIR image, Petschnigg *et al.* [9]. Bottom: Zhuo *et al.* [22], Yan *et al.* [18], the proposed method.



Top: Input RGB image, input NIR image, Petschnigg *et al.* [9]. Bottom: Zhuo *et al.* [22], Yan *et al.* [18], the proposed method.

Blind Image Quality Assessment (BIQA)

Table 1. BIQA comparison between different methods (bold: best, underline: second).

Method	Fig. 3	Fig. 4	Fig. 5	Average
He *et al.* [4]	36.66	**28.75**	21.23	28.88
Petschnigg *et al.* [9]	31.56	46.52	<u>20.23</u>	32.77
Zhuo *et al.* [22]	**25.17**	35.74	22.82	27.91
Yan *et al.* [18]	<u>25.73</u>	31.72	20.94	<u>26.13</u>
Proposed method	26.20	<u>31.14</u>	**19.12**	**25.49**

Runtime with image resolution:1920x1080.

Table 2. Average runtime comparison between different methods.

Method	Runtime (sec/pair)
He *et al.* [4]	2.98
Petschnigg *et al.* [9]	59.31
Zhuo *et al.* [22]	38.02
Yan *et al.* [18]	97.87
Proposed method	**2.74**

Thanks!