Multispectral image fusion based on super pixel segmentation
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The proposed method

Example of the proposed fusion method results. From left to right: input RGB image, the proposed fusion result, input NIR image. The proposed fusion contains both the color information of the RGB and the far details captured by the NIR image.

This paper focuses on the task of fusing color (RGB) and near-infrared (NIR) images as this the typical RGBT sensors, as in multispectral cameras for detection, fusion, and dehazing. Indeed, the NIR channel has the ability to capture details not visible in RGB and see beyond haze, fog, and clouds.

RGB   Fusion   NIR

Experiments

RGB   Fusion   NIR
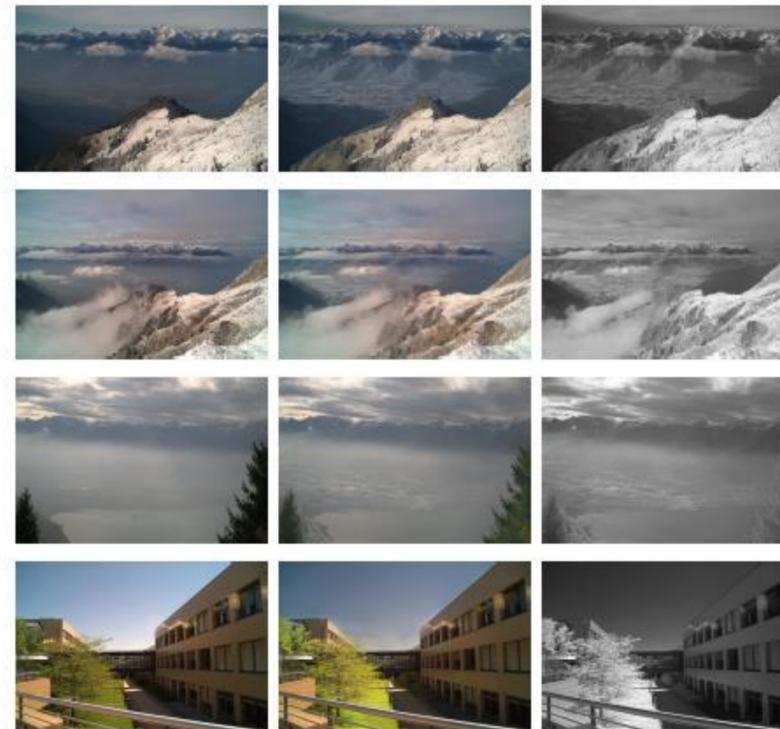
Comparisons

SuperPixel   PCA   Spectral
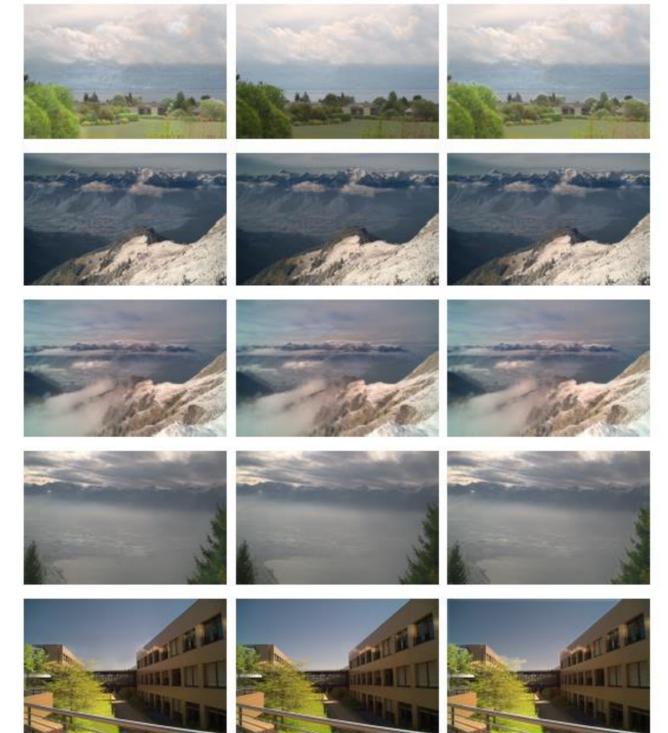
Super-pixel fusion

The grades that are computed by the proposed method on the input NIR and RGB images from Figure. Dark indicates super pixels with a low level of information.

I introduce the proposed approach of multispectral image fusion by region content analysis. It extends the concepts behind PCA and spectral fusion by relying on the local content of the fused images that are expressed using high-order statistics to compute fusion weights for each pixel.

RGB   Super Pixels Grades   NIR

Canny edge preservation

Category	SuperPixel	PCA	Spectral
Country	**54.7**	53.1	51.3
Mountain	**58.4**	56.6	54.4
Urban	**76.4**	**76.4**	74.5
Street	59.3	**59.7**	55.9

SSIM

Category	SuperPixel	PCA	Spectral
Country	**81.5**	74.1	78.9
Mountain	**89.9**	89.6	88.1
Urban	93.8	**93.9**	92.7
Street	**87.5**	87.3	85.5

Conclusions

- This paper introduced a new method for multispectral fusion which applies a spatial soft map based on input image superpixel segmentation.

- This method shows advantages over existing approaches such that the details in the input images are preserved better in the fusion result, and still, the information of the color remains valid.

- As a whole, this paper produces an informative research work on the interesting problem of multispectral image fusion, in the color RGB to NIR domain.