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Original article

Optimal quality for image fusion with interpolatory parametric filters☆

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Abstract

A possible definition of the term *fusion* could be a simultaneous combination of output information from several sources. Using complementary data, image fusion may improve quality and consequently interpretability of the result. There are many different ways to proceed with image fusion and several general frameworks have been used for fusing images. Standard image fusion methods are often successful at injecting spatial detail into the multispectral imagery but distort the color information in the process. During the last decade a great amount of research has been devoted concerning the application of wavelet transforms in image fusion. Multiresolution decompositions have proved their superiority against other traditional fusion techniques, particularly in terms of minimizing color distortion. By other side, the subject of wavelet has an interdisciplinary relation to subdivision schemes, which has brought on reciprocal interest in both areas. In this work we propose to use a class of subdivision filters or masks depending on a control parameter in order to perform image fusion in the framework of shift invariant discrete multiresolution transforms. As a consequence, we obtain a fusion procedure with a free parameter. This degree of freedom have two main advantages. First, by giving different numerical values to the parameter it is possible to change some features of the resulting image. The second advantage is that it is possible to obtain the value of the parameter in order to solve certain constraint problem formulated in terms of standard measures. The parametric solution of the problem ensures optimal quality of the resulting fused image. In this sense, our approach provides optimal results and it is more dynamic than previous works.

Keywords: Image quality evaluation; Image fusion; Multiresolution algorithms

1. Introduction

The objective of image fusion is to combine information from several images of the same picture or scene. There are many situations, for instance in remote sensing, that simultaneously require high spatial and high spectral resolution in a single image. The high spatial resolution is taken from a panchromatic image (PAN) while high spectral resolution is achieved from a multispectral (MS) decomposition of a low spatial resolution of another image. By other side, there exists an inverse relation between both types of resolutions [16].

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