

A Joint Sparse and Low-Rank Decomposition for Pansharpening of Multispectral Images

Abstract:

Pansharpening aims to fuse a high-resolution panchromatic (PAN) image and a low-resolution multispectral (MS) image. Several synthesis techniques have been reported to solve the problem of pansharpening. Details injection (DI) consists of the cascaded processes of details extraction and injection. The former is crucial for performance. By exploiting the relationship among multiple data acquired on the same scene through different sensors, this paper first develops a joint sparse and low-rank (JSLR) decomposition with an assumption that multiple data have a common low-rank component. Then, a novel DI-type pansharpening method is proposed based on JSLR decomposition, named as JSLR-based pansharpening (JSLRP). In JSLRP, the injected spatial details are calculated as a linear combination of JSLR decomposed components. To ensure the low-rank condition, the JSLR is implemented on the PAN and MS images in the nonlocal similar patches form by adopting the nonlocal self-similarity. Finally, the superiority of JSLRP is demonstrated by comparing with several well-known methods on the reduced-scale data and full-scale data.