
Pairwise Operator Learning for Patch-Based Single-Image Super-Resolution

Abstract:

Motivated by the fact that image patches could be inherently represented by matrices, single-image super-resolution is treated as a problem of learning regression operators in a matrix space in this paper. The regression operators that map low-resolution image patches to high-resolution image patches are generally defined by the left and right multiplication operators. The pairwise operators are, respectively, used to extract the row and column information of low-resolution image patches for recovering high-resolution estimations. The patch-based regression algorithm possesses three favorable properties. First, the proposed super-resolution algorithm is efficient during both training and testing, because image patches are treated as matrices. Second, the data storage requirement of the optimal pairwise operator is far less than most popular single-image super-resolution algorithms, because only two small sized matrices need to be stored. Last, the super-resolution performance is competitive with most popular single-image super-resolution algorithms, because both row and column information of image patches is considered. Experimental results show the efficiency and effectiveness of the proposed patch-based single-image super-resolution algorithm.