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Texture Enhancement for Improving Single-Image Super-Resolution Performance

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Abstract. Although various single-image super-resolution algorithms have been developed to increase image resolution, they still do not provide adequate performance in the texture region due to the lack of fine textures in the processed image. In this paper, we present a novel texture enhancement strategy in order to improve the super-resolution performance in the texture region. For texture enhancement, we extract a low-resolution texture layer from an input image and generate a high-resolution texture layer by applying the proposed texture synthesis algorithm. A texture enhanced high-resolution image is then obtained by properly combining the generated high-resolution texture layer with an image obtained by using an existing single-image super-resolution algorithm. Experimental results show that the proposed texture enhancement strategy provides sharper and more natural looking textures compared with the existing super-resolution algorithms.

Keywords – texture enhancement, single-image super-resolution, texture synthesis.

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1 Introduction

Various single-image super-resolution (SR) algorithms have been proposed in efforts to increase image resolution [1-26]. Among them, an example-based SR algorithm generated a high-resolution (HR) image by modeling the relationship between mid-frequency (MF) and high-frequency (HF) patches [1]. Based on example-based SR, the sharpness of HF patch candidates was examined according to the patch characteristics and was used to determine appropriate HF patches [2]. Using a manifold assumption adopted in example-based SR, several neighbor embedding approaches were proposed to utilize the local geometry for low-resolution (LR) to HR patch mapping [3-7]. The other approaches were proposed on the basis of the sparse representation of LR patches using a HR patch dictionary [8-12].

To improve the performance of example-based SR, self-example-based SR approaches were proposed by exploiting the patch redundancy among in-scale and cross-scale images [13-15]. A reconstruction-based SR approach was proposed on the basis of feedback-control