Author's Accepted Manuscript

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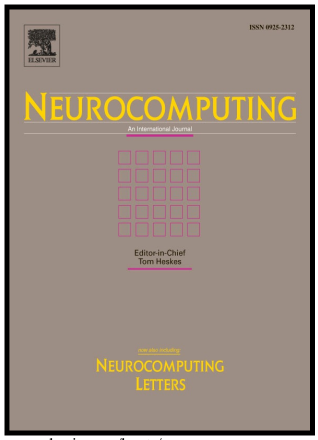

www.elsevier.com/locate/neucom

PII: S0925-2312(16)31464-3
DOI: http://dx.doi.org/10.1016/j.neucom.2016.11.049
Reference: NEUCOM17806

To appear in: *Neurocomputing*

Received date: 17 May 2016
Revised date: 22 November 2016
Accepted date: 27 November 2016

Cite this article as: Yang Zhao, Rong-Gang Wang, Wei Jia, Wen-Min Wang and Wen Gao, Iterative Projection Reconstruction for Fast and Efficient Image Upsampling, *Neurocomputing,* http://dx.doi.org/10.1016/j.neucom.2016.11.049

Iterative Projection Reconstruction for Fast and Efficient Image Upsampling

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Abstract—With the development of ultra-high-resolution display devices, the visual perception of fine texture details is becoming increasingly important. Traditional image upsampling methods suffer from either loss of high-frequency texture details or very high time cost. In this paper, we propose an iterative projection reconstruction (IPR) method for fast and efficient image upsampling. The proposed method refines high-frequency texture details with an iterative projection process, and utilizes the pre-computed projection matrix to accelerate the example-based image reconstruction. As a result, the proposed method can reproduce fine texture details with low time cost. Experimental results demonstrate that the proposed method outperforms some state-of-the-art methods.

Index Terms—Upsampling, single-image super-resolution, projection reconstruction

1. Introduction

Image upsampling, which aims to recover a high-resolution image (HRI) from a low-resolution image (LRI), is a basic problem for various applications in machine vision and image processing, such as digital photographs editing, ultra–high-definition (UHD) display, medical image processing, and object recognition. Recently, some specific super-resolution scenarios have also drawn significant attention, such as face hallucination [44], [45], depth-image upsampling [50]-[52]. It is an ill-posed problem since much information is lost during the downsampling of original HRIs. How to reconstruct the missing details of high quality HRIs with low cost is still a challenging task.

One fundamental technique of image upsampling is the interpolation-based algorithm, such as nearest neighbor, bilinear, bicubic, and splines [1], [2]. These kernel-based interpolations are efficient and fast. However, these traditional methods have two obvious demerits: firstly, these methods tend to produce some unnatural artifacts such as blurring and zigzag edges; Secondly, the simple interpolations cannot reproduce the lost high-frequency (HF) details. Recent interpolation-based methods try to suppress unnatural artifacts

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