

Single-Image Example-Based Super-Resolution Using Markov Random Fields

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I. INTRODUCTION

Super-resolution (SR) plays an important role in image processing applications nowadays due to the huge amount of low quality video and image material. Low quality is a consequence of using low-cost imaging sensors for image/video acquisition, such as web-cameras, cell phone and surveillance cameras. Furthermore, the increasing popularity of HDTV makes the SR methods necessary for resolution enhancement of NTSC and PAL recordings. The task of SR is to infer a HR image from one or more low resolution (LR) images. There are two main approaches: classical and example-based.

II. PROPOSED METHOD AND RESULTS

In this paper, we present a new example-based SR method that exploits self-similarity across different resolution scales of the input image. Missing high frequencies are filled in by searching for highly similar patches in the database that contains high-resolution information. In our case, the database is the image itself, like in [2], while in the original approach from [1] an external database of images is used. The main benefits in comparison with [1] are faster search and absence of "hallucination" effect. Compared with [2], we avoid using classical approach on top of example-based one since it can cause additional errors due to sub-pixel accuracy. Specifically, we search for

k nearest neighbours of each input LR patch within the Gaussian pyramid of the input LR image. The corresponding HR patches (from higher pyramid level) of those nearest neighbours are copied to the corresponding locations in the HR image by combining them in a globally consistent manner. This is achieved by Markov Random Field modelling, as originally suggested in [1]. Therefore, our approach combines the search method from [2] and the reconstruction method from [1], improving on both of them at the same time. Fig. 1 demonstrates better performance than reference technique from [2] and standard bi-cubic interpolation for magnification factor 4.

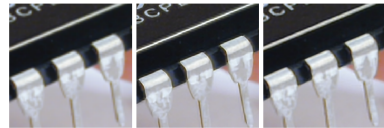


Figure 1. From left to right: bi-cubic interpolation, [2] and the proposed method

III. CONCLUSIONS

We presented a novel method for single image super-resolution that improves on two methods upon which it was built. We demonstrated its potential with result.

REFERENCES

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- [2] Glasner, D., Bagon, S., Irani, M.: Super-Resolution from a Single Image. In: *ICCV* (2009)

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