

Face Hallucination for Single-frame, Low-resolution Facial Images

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Abstract

Handling low-resolution images is one of the most difficult problems commonly encountered in various kinds of image processing applications, such as the generation of 3-D models, analysis of scientific/medical/astronomical/weather images, archiving, retrieval, and transmission of these images, video surveillance, and monitoring.

In this lecture, I will introduce a face hallucination method for the reconstruction of high-resolution facial images from single-frame, low-resolution facial images. The method has been derived from example-based hallucination methods and morphable face models. First, I will introduce a recursive error back-projection method to compensate for residual errors, and a region-based reconstruction method to preserve characteristics of local facial regions. Then, I will define an extended morphable face model, in which an extended face is composed of the interpolated high-resolution face from a given low-resolution face, and its original high-resolution equivalent. Then, the extended face is separated into an extended shape and an extended texture.

I will also show the results of various hallucination experiments using the MPI, XM2VTS, and KF databases, compare the reconstruction errors, structural similarity index, and recognition rates, and show the effects of face detection errors and shape estimation errors. The encouraging results demonstrate that the methods can improve the performance of face recognition systems. Especially the method can enhance the resolution of single-frame, low-resolution facial images.