# Efficient Enhancement of Image Interpolation as an Inverse Problem on Corneal Image

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**Abstract**

This paper focuses on solving the image interpolation problem of noisy images as an inverse problem considering the mathematical model which relates the available noisy low resolution (LR) image to the required high resolution (HR) image. The paper presents four different solutions to this problem and compares their performance. First, an adaptive least squares interpolation algorithm is presented. Second, a Linear Minimum Mean Square Error (LMMSE) solution is suggested. An efficient implementation of this solution as a single sparse matrix inversion is presented. The sensitivity of this solution to the estimates of noise variance and the HR image autocorrelation is studied. Third, a mathematical model is derived for image interpolation based on the maximization of entropy of the required HR image a priori. This model is implemented as a single sparse matrix inversion. Finally, a sectioned implementation of regularized image interpolation is presented and implemented as a single matrix inversion as well. The effect of the choice of the regularization parameter on this solution is studied. The performance of all the above mentioned algorithms is compared from the PSNR, the computation cost and the edge preservation ability points of view.

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