Image enhancement of 4 dimensional biomedical images with regularization.

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Abstract

It is well known that biomedical images that are used to diagnose tumors, injuries, and other defects in our bodies are optimal if they are free of blur and noise. That increases the confidence of the accuracy of the diagnosis and the use of the correct treatment. Biomedical Images however are susceptible to blur from the recording medical equipment and the motion of the patient as well as noise. As the equipment, for example the MRI scanners develop, the blurring changes but for each machine the blur can be estimated using phantoms and so it is important to keep studying them and finding more effective and efficient algorithms for image deblurring that work fast. Deblurring of the signals in addition to denoising is therefore essential for the efficient use of the signals in related applications. In our work, we apply a statistical Optimal Filtering method uses the Singular Value Decomposition of a first estimate of the blurring matrix and statistics to quantify uncertainty and to deblur the signal in an efficient and effective way. The method was originally developed for two dimensional images and is modified to be applied to higher dimensional signals. In this talk, we will present the method and discuss its effectiveness using a brain MR image.

References

V. Taroudaki and D.P. O'Leary, "Near-Optimal Spectral Filtering and Error Estimation for Solving Ill Posed Problems", SIAM J. Sci. Comput. 37-6(2015), pp. A2947-A2968