Continuous Model for T2 Map in Magnetic Resonance Imaging

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In the present work, we develop a continuous model based on spline functions, in order to determine the T2 Map in Magnetic Resonance Imaging. The T2 parameter corresponds to the time decay parameter of spin relaxation, which cannot be obtained directly from one image, since it has to be calculated by fitting an exponential decaying functions from series of images. The calculation of the T2 map is done by means of a mutlivariate optimization, where the coefficients of the spline functions are adjusted in order to minize the square of the distance between the data source images and the resulting T2 decaying exponential for each pixel.

In the traditional discrete pixel model fitting, the fitting is done independently for each pixel or position within the image, using no information of the surrounding pixels. On the other hand, the use of information of the neighborhood is a consequence of the use of the continuous spline based setting. Therefore, the utilization of spline functions in the continuos domain reduces the relative shift effect between the source images, reducing also some noise effect present at hte time of the acquisition of the image. Although the spline setting is more computationally expensive compared to the discrete one, better visual results are obtained. To speed up the computation, a multilevel approach associated to the multilevel nature of the spline functions was implemented giving also stability to the inverse problem of computing the B-spline coefficients.