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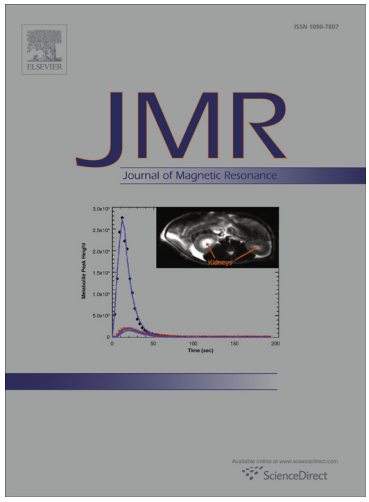

Communication

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Estimation of Spin-Echo Relaxation Time

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Abstract

In spin-echo-based EPR oximetry, traditional methods to estimate the T_2 relaxation time, which encodes the oxygen concentration of the sample, include fitting an exponential to the peaks or the integrated areas of multiple noisy echoes. These methods are suboptimal and result in a loss of estimation precision for a given acquisition time. Here, we present the maximum likelihood estimate (MLE) of T_2 from spin-echo data. The MLE provides, for the data considered, approximately 3-fold time savings over echo-integration and more than 40-fold time savings over peak-picking. A one-dimensional line search results in simple computation of MLE. It is observed that, perhaps counter-intuitively, prior knowledge of the line shape does not yield additional reduction of estimation error variance. The result also illuminates the near optimal performance of T_2 estimation via principal components calculated by a singular value decomposition. The proposed method is illustrated

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