Robust Estimation of HDR in fMRI using H-infinity Filters

Estimation and detection of the hemodynamic response (HDR) are of great importance in functional MRI (fMRI) data analysis. In this paper, we propose the use of three H-infinity adaptive filters (finite memory, exponentially weighted, and time-varying) for accurate estimation and detection of the HDR. The H8 approach is used because it safeguards against the worst case disturbances and makes no assumptions on the (statistical) nature of the signals [B. Hassibi and T. Kailath, in Proc. ICASSP, 1995, vol. 2, pp. 949-952; T. Ratnarajah and S. Puthusserypady, in Proc. 8th IEEE Workshop DSP, 1998, pp. 1483-1487]. Performances of the proposed techniques are compared to the conventional t-test method as well as the well-known LMSs and recursive least squares algorithms. Extensive numerical simulations show that the proposed methods result in better HDR estimations and activation detections.

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