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THE FAST DATA PROJECTION METHOD FOR STABLE SUBSPACE TRACKING (MonAmOR1)

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✶ Abstract :   In this article we consider the Data Projection Method (DPM), which constitutes a simple and reliable means for adaptively estimating and tracking subspaces. Specifically we propose a fast and numerically robust implementation of DPM. Existing schemes can track subspaces corresponding either to the largest or the smallest singular values. DPM, on the other hand, with a simple change of sign in its step size, can switch from one subspace type to the other. Our fast implementation of DPM preserves the simple structure of the original DPM having also a considerably lower computational complexity. The proposed version provides orthonormal vector estimates of the subspace basis which are numerically stable. In other words, our scheme does not accumulate roundoff errors and therefore preserves orthonormality in its estimates. In fact, our scheme constitutes the only numerically stable, low complexity, algorithm for tracking subspaces corresponding to the smallest singular values. In the case of tracking subspaces corresponding to the largest singular values, our scheme exhibits the fastest convergence–towards–orthonormality among all other subspace tracking algorithms of similar complexity.

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