Research

Continuation methods for nonnegative Rank-1 approximation of nonnegative Tensors

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摘　要：

In this paper, the rank-1 approximation of a nonnegative tensor $\mathcal{A} \in \mathbb{R}_{\geq 0}^{n_1 \times \cdots \times n_m}$ is considered. Mathematically, the approximation problem can be formulated as an optimization problem. The Karush-Kuhn-Tucker (KKT) point of the optimization problem can be obtained by using the nonnegative Z-eigenvector $\mathbf{y}$ of enlarged tensor $\mathcal{G}$. Therefore, we propose an iterative method with prediction and correction steps for computing nonnegative Z-eigenvector $\mathbf{y}$ of enlarged tensor $\mathcal{G}$, called the continuation method. We show that the computation requires only $O(\prod_{i=1}^{m} n_i)$ flops for each iteration and the computed Z-eigenvector $\mathbf{y}$ has nonzero component block, and hence, the KKT point can be obtained. Besides, we show that the KKT point is a local optimizer of the optimization problem. Numerical experiments are provided to support the theoretical results.

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