Olivia R. Vasquez* (vasquezol@cwu.edu), Amadou Y. Bah and Jackson Abascal. A Non-iterative Parallelizable Eigenbasis Algorithm for Johnson Graphs. Preliminary report.

We present a new \(O\left(k^2\binom{n}{k}^2\right)\) method for generating an orthonormal basis of eigenvectors for the Johnson graph \(J(n, k)\). Unlike standard methods for computing a full eigenbasis of sparse symmetric matrices, the algorithm presented here is non-iterative, and produces exact results under an infinite-precision computation model. In addition, our method is highly parallelizable; given access to unlimited parallel processors, the eigenbasis can be constructed in only \(O(n)\) time given \(n\) and \(k\). We also present a highly parallelizable algorithm for computing projections onto the eigenspaces of \(J(n, k)\). Such an algorithm is useful for spectral analysis, in which these eigenspaces serve as spaces of ordered effects for data modeled on subsets of \(\{1, \ldots, n\}\) of a fixed size \(k\). (Received September 26, 2018)