Higher-order singular value decomposition and the reduced density matrices of three qubits

ABSTRACT

In this paper, we demonstrate that higher order singular value decomposition (HOSVD) can be used to identify special states in three qubits by local unitary (LU) operations. Since the matrix unfoldings of three qubits are related to their reduced density matrices, HOSVD simultaneously diagonalizes the one-body reduced density matrices of three qubits. From the all-orthogonality conditions of HOSVD, we computed the special states of three qubits. Furthermore, we showed that it is possible to construct a polytope that encapsulates all the special states of three qubits by LU operations with HOSVD.