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Algebraic formulation of general quantum teleportations

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Quantum teleportation(QT) can be interpreted as transferring coefficients of quantum basis states. First, the QT of a qubit is reviewed in this context. Then the general QT of a qudit, which is a quantum system with d basis states, is introduced and explained in the same context. The construction of generalized Bell states consists of two steps. First, a full matrix of twin qudit bases is decomposed into d matrices with only one element in each row and column, which makes it possible to tranfer the coefficients from the first qudit to the last using a Latin square which is the generalization of Controlled-NOT for qubit systems. Then, a generalized Hadamard transformation is applied to linearly superpose all the components with equal weights.

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