

AN ALMOST CONVINCING SCHEME FOR DISCRIMINATION OF PREPARATION BASIS FOR A QUANTUM ENSEMBLE AND WHY IT WILL NOT WORK

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Mixed states of a quantum system, represented by density operators, can be decomposed as a statistical mixture of pure states in a number of ways where each decomposition can be viewed as a different preparation recipe. The non-unique decomposition of a density matrix makes it impossible to estimate the preparation basis for the quantum system. Here we present a measurement scheme to (seemingly) improve the performance of unsharp measurements. We argue that in some situations this scheme is capable of providing statistics from a single quantum system, thus, making it possible to perform state tomography from a single copy. One of the byproduct of the scheme is a way to distinguish between different preparation methods used to prepare the state of the quantum system. However, our numerical simulations disagree with our intuitive predictions. We show that a counter-intuitive property of biased classical random walk is responsible for the proposed mechanism to not work.

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