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Quantum Behavior of an Autonomous Maxwell Demon ADRIAN CHAPMAN, AKIMASA MIYAKE, Univ of New Mexico — A Maxwell Demon is an agent that can exploit knowledge of a system's microstate to perform useful work. The second law of thermodynamics is only recovered upon taking into account the work required to irreversibly update the demon's memory, bringing information theoretic concepts into a thermodynamic framework. Recently, there has been interest in modeling a classical Maxwell demon as an autonomous physical system to study this information-work tradeoff explicitly. Motivated by the idea that states with non-local entanglement structure can be used as a computational resource, we ask whether these states have thermodynamic resource quality as well by generalizing a particular classical autonomous Maxwell demon to the quantum regime. We treat the full quantum description using a matrix product operator formalism, which allows us to handle quantum and classical correlations in a unified framework. Applying this, together with techniques from statistical mechanics, we are able to approximate nonlocal quantities such as the erasure performed on the demon's memory register when correlations are present. Finally, we examine how the demon may use these correlations as a resource to outperform its classical counterpart.

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