

Optimal protocols for a Maxwell Demon device with errors

Vegard Sørdal,¹ Joakim Bergli¹ and Yuri Galperin^{1,2}

¹Department of Physics, University of Oslo, Oslo, Norway

²Lofte Institute, Russian Academy of Sciences, St. Petersburg, Russian Federation

In any general cycle of measurement, feedback and erasure, the measurement will reduce the entropy of the system when information about the state is obtained, while erasure, according to Landauer's principle, is accompanied by a corresponding increase in entropy due to the compression of logical and physical phase space. The total process can in principle be fully reversible. A measurement error reduces the information obtained and the entropy decrease in the system. The erasure still gives the same increase in entropy and the total process is irreversible. Another consequence of measurement error is that a bad feedback is applied, which further increases the entropy production if the proper protocol adapted to the expected error rate is not applied. We consider the effect of measurement error on a realistic single-electron box Szilard engine, and find the optimal protocol for the cycle as a function of the desired power P and error ε .