Cleverest Maxwell's demon

鹿野　豊
分子科学研究所

Entropy is one of the most cardinal concepts in the modern science. The interplay of entropy in classical physics and information science has been studied intensively since it was first pointed out by Brillouin in the general context. The well-known example is Maxwell's demon. The paradox was resolved by Landauer and Bennett considering the demon's memory, which is well known as the information erasure principle. In this poster, to clarify the essence of the information erasure, we consider an asymmetric Szilard engine model of Maxwell's demon. We show the equivalence between information theoretical and thermodynamic entropies when the demon erases information optimally. The work gain by the engine can be exactly canceled out by the work necessary to reset demon's memory after optimal data compression a la Shannon before the erasure [1]. More specifically, the 1-bit memory erasure and reset should be the cost of the work $k_B T \ln 2$ in the symmetric $0-1$ memory model. It is noted that this is only used by the combined gas law. In the Landauer and Bennett mechanism, the equivalence between the information theoretical and thermodynamical entropies were unclear since there does not appear the information theoretical entropy. This comes from the optimal data compression. Here is our main result. Furthermore, I would like to give the presentation on the relationship between the information theoretical and statistical entropies.

参考文献

[1] A. Hosoya, K. Maruyama, and Y. Shikano, Phys. Rev. E **84**, 061117 (2011).