[Talk 7] Realization of a Brownian information motor under real time feedback control

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Recent studies on the relation between information and thermodynamics showed that in the presence of a feedback control, an information quantity known as mutual information, should be included in describing non-equilibrium dynamics of fluctuating systems. Here, we designed an information motor that consists of a colloidal particle in a single heat bath. The motor is capable of transporting the particle along one direction by utilizing the information about the microscopic state of the system. In addition, this motor can be considered as a Brownian motor that makes an effective temperature gradient at the particle. We measured the average extracted work for various cycle time t and found that the average extracted work per engine cycle increases with increasing t, and for large t, our system is capable of achieving an upper bound to the extractable work thereby verifying the generalized second law of thermodynamics. We have also investigated the relation between the average transport velocity, average extracted work and information quantity. For a given t, the average transport velocity is limited by the amount of extracted work or information gained per cycle.