Two-level motion of Brownian particle

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Consider motion of Brownian particle in a fluid at temperature $T = T(x,t)$, under the influence of a conservative field of force. The field is such that on a particle in state A acts the force

$F^A = -\nabla V^A$, and on a particle in state B acts the force $F^B = -\nabla V^B$, where

V^A and V^B denote respective potentials.

It is shown that the system subjects the first law of thermodynamics and conditions for satisfying the second law are given. Also the behaviour of a system in isothermal conditions beyond a detailed balance is considered.

The considered motion may be interpreted as a description of motor assemblies such as myosin or dynein. The existence of two states, attached and detached, is essential for generation of their motion.