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Directed motion and useful work from an isotropic non-equilibrium distribution DANIEL KOSOV, University of Maryland, MAXIM GELIN, TU Munich — Since the Maxwell demon thought experiment, the extraction of useful work and directed motion from unbiased non-equilibrium distributions has been the source of fascination, intrigue, and confusion. Being a fundamental scientific problem, it is also of signficant practical interest for various biological and nanotechnological applications. We propose a new type of "motor" driven by the heat flow between non-equilibrium velocity and equilibrium coordinate distributions. Namely, we demonstrate that a gas of classical particles trapped in an external asymmetric potential undergoes a quasiperiodic motion, if the temperature of its initial velocity distribution Tne differs from the equilibrium temperature Teq. The magnitude of the effect is determined by the value of Tne - Teq, and the direction of the motion is determined by the sign of this expression. The "loading" and "unloading" of the gas particles change directions of their motion, thereby creating a possibility of shuttle-like motion. The system works as a Carnot engine where the heat flow between kinetic and potential parts of the non-equilibrium distribution produces the useful work. Phys.Rev. E 77, 011115 (2008)

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