Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Moving magnetic nanoparticles through soft-hard magnetic composite system[1] HEMACHANDER SUBRAMANIAN, JONG HAN, State University of New York at Buffalo — An important requirement during the design of a nano-electromechanical system is the ability to move a nanoparticle from one point to another in a predictable way. Through simulations, we demonstrate that soft-hard magnetic stuctures can help us move nanoparticles predictably. We simulated a 2-D system, in which the exchange-coupled soft-magnetic magnetization is frustrated with the boundary condition set by a hard magnetic array and rotating external field. We consider a geometry with three-fold degenerate magnetic local minima and show that the hysteretic transitions are manipulated by an external field. Due to the reduced interfacial energy from weak demagnetization energy in the composite magnets and magnetic hysteresis, the energy landscape can be manipulated in a well-defined and predictable manner. We apply this idea to control the movement of a magnetic particle placed on a non-magnetic layer on top of the structure. We are interested in extending this simple, preliminary study to include complex geometries. We expect that complex geometrical constraints would lead to interesting orbits of nanoparticles in these systems.

[1]Supported by NSF DMR-0426826

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Date submitted: 22 Nov 2006 Electronic form version 1.4