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Geometric Constraints on Planar Manipulation of Microparticles via Magnetic Traps C. PIERCE, M. PRIKOCKIS, R. SOORYAKUMAR, Ohio State Univ - Columbus — Recently, thin film based devices have been developed to trap and transport particles via localized magnetic fields and the associated strong gradients found at domain walls in patterned wires. In scaling up the device performance to achieve greater throughput and finer control over the spatial resolution in maneuvering the particles, it is necessary to understand the constraints imposed by the architecture of the wires. Due to shape anisotropy, ferromagnetic microstructures of $Co_{0.5}Fe_{0.5}$ comprising isolated and connected linear segments acquire stable magnetic domain states when magnetized in an external field. The stray fields in the vicinity of the domain walls, when combined with weak external fields ($\sim$ 10 Oe), create sites which controllably attract or repel superparamagnetic micro-particles. The dependence of trap strength on device scale, aspect ratio, geometry and orientation relative to magnetizing field and neighboring sites are investigated through simulation and experiments involving magnetic microparticles of various sizes. Constraints placed on the types of manipulations achievable with this scheme and their implications towards realizing high throughput Lab-on-a-Chip devices will be discussed.

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