MANIPULATING CELLS WITH A DYNAMICALLY RECONFIGURABLE ELECTRO-MAGNETIC COIL

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Current cancer screening techniques are often labor-intensive, require high initial costs, and are difficult to apply to cytology samples because of their heterogeneous nature. To address these issues, we are participating in a project to develop a low-cost chip for cell enrichment. The proposed system uses water-based bio-compatible ferrofluids as a uniform magnetic environment that surrounds the non-magnetic (cancer) cells within a set of microfluidic channels and reservoirs. The novelty of our approach is that we apply an external magnetic field generated by a dynamically-reconfigurable electromagnetic coil. The magnetic field will push away the non-magnetic objects (including cancer cells) so that they can be potentially trapped, manipulated and directed towards a specific location. In this research, we developed the reconfigurable electromagnetic coil with the help of a mathematical model of the motion of non-magnetic particles in ferrofluids induced by (changing) magnetic fields. This model was used to compute the magnetic fields required for effective particle manipulation. Test results of an actual microfluidic device equipped with our electromagnetic coil are presented.