Abstract Submitted
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Fiber optic spanner BRYAN BLACK, SAMARENDRA MOHANTY, UT Arlington — Rotation is a fundamental function in nano/biotechnology and is being useful in a host of applications such as pumping of fluid flow in microfluidic channels for transport of micro/nano samples. Further, controlled rotation of single cell or microscopic object is useful for tomographic imaging. Though conventional microscope objective based laser spanners (based on transfer of spin or orbital angular momentum) have been used in the past, they are limited by the short working distance of the microscope objective. Here, we demonstrate development of a fiber optic spanner for rotation of microscopic objects using single-mode fiber optics. Fiber-optic trapping and simultaneous rotation of pin-wheel structure around axis perpendicular to fiber-optic axis was achieved using the fiber optic spanner. By adjusting the laser beam power, rotation speed of the trapped object and thus the microfluidic flow could be controlled. Since this method does not require special optical or structural properties of the sample to be rotated, three-dimensional rotation of a spherical cell could also be controlled. Further, using the fiber optic spanner, array of red blood cells could be assembled and actuated to generate vortex motion. Fiber optical trapping and spinning will enable physical and spectroscopic analysis of microscopic objects in solution and also find potential applications in lab- on-a-chip devices.

Samarendra Mohanty
UT Arlington

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