Transporting micro-particles by using optical line segments generated by holographic optical tweezers

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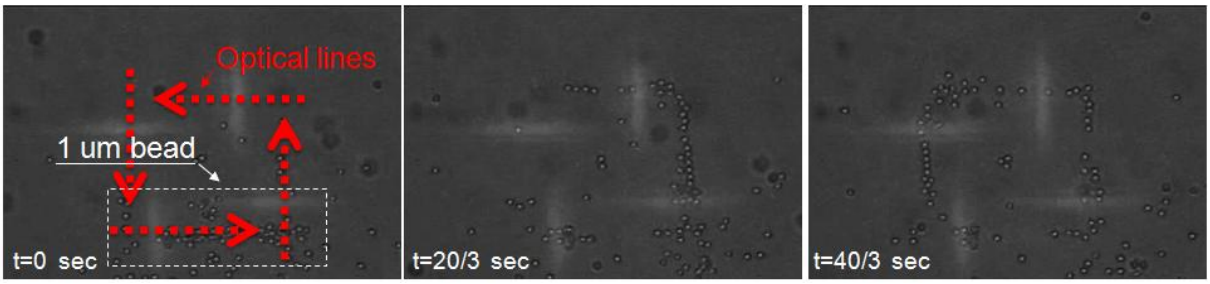
In recent year, incorporating a spatial light modulator with optical tweezers provides us an easy way to control the light field for optical manipulation. Not only multiple traps but also arbitrary intensity distribution can be created [1]. However, most proposed methods for controlling light field focus only on controlling gradient force [2]. Thus only one of two optical forces, gradient force and scattering force, is used for optical manipulation. In this paper, we proposed a method of controlling both the gradient force and the scattering force simultaneously for transporting micro-particles.

The figure shown below is a sequence snapshot of our experiment result. The time interval between each picture is 20/3 seconds. In this experiment, four optical line segments are generated on the sample plane which contains the solution of 1 micrometer beads. In each line segment, indicated by a bold dash line, the scattering force is along the arrow. In addition, these four optical line segments are arranged to form a closed square path. From the figure, we can see that as particles are trapped in the line segment, the particles move along the line segment automatically.



[1]Jennifer E. Curtis, Brian A. Koss, David G. Grier, Dynamic holographic optical tweezers Opt. Comm., 2002, 207:169-175.
[2] Jonathan Leach, Kurt Wulff, etc "Interactive approach to optical tweezers control", App. Opt. 2006, 45:897-903.