



Machine-vision based optofluidic cell sorting.

Glückstad, Jesper; Bañas, Andrew

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Glückstad, J., & Bañas, A. (2015). Machine-vision based optofluidic cell sorting.. Abstract from EU FP7 CoMMITMenT, London, United Kingdom.

DTU Library

Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Machine-vision based optofluidic cell sorting

Jesper Glückstad¹ and Andrew Bañas²

¹DTU Fotonik, Technical University of Denmark, Oersted Plads 343, DK-2800 Kgs. Lyngby, Denmark

²OptoRobotix ApS, Scion DTU, Diplomvej 381, DK-2800 Kgs. Lyngby, Denmark

Abstract

In contemporary life science there is an increasing emphasis on sorting rare disease-indicating cells within small dilute quantities such as in the confines of optofluidic lab-on-chip devices. Our approach to this is based on the use of optical forces to isolate red blood cells detected by advanced machine vision¹. This approach is gentler, less invasive and more economical compared to conventional FACS-systems. As cells are less responsive to plastic or glass objects commonly used in the optical manipulation literature², and since laser safety would be an issue in clinical use, we develop efficient approaches in utilizing lasers and light modulation devices. The Generalized Phase Contrast (GPC) method³⁻⁹ that can be used for efficiently illuminating spatial light modulators¹⁰ or creating well-defined contiguous optical traps¹¹ is supplemented by diffractive techniques capable of integrating the available light and creating 2D or 3D beam distributions aimed at the positions of the detected cells. Furthermore, the beam shaping freedom provided by GPC can allow optimizations in the beam's propagation and its interaction with the laser catapulted and sorted cells.

References

1. A. Banas, D. Palima, F. Pedersen, and J. Glückstad, "Development of a compact bio-optofluidic cell sorter," SPIE OPTO 82740N-82740N (2012).
2. J. Glückstad, "Optical manipulation: sculpting the object", *Nature Photonics*, Vol. 5, 7-8 (2011).
3. D. Palima, C. A. Alonzo, P. J. Rodrigo, and J. Glückstad, "Generalized phase contrast matched to Gaussian illumination," *Opt. Express* 15, 11971–7 (2007).
4. D. Palima and J. Glückstad, "Gaussian to uniform intensity shaper based on generalized phase contrast," *Opt. Express* 16, 1507–16 (2008).
5. D. Palima and J. Glückstad, "Multi-wavelength spatial light shaping using generalized phase contrast," *Opt. Express* 16, 1331–42 (2008).
6. S. Tauro, A. Bañas, D. Palima, and J. Glückstad, "Experimental demonstration of Generalized Phase Contrast based Gaussian beam-shaper," *Opt. Express* 19, 7106–11 (2011).
7. A. Bañas, D. Palima, M. Villangca, T. Aabo, and J. Glückstad, "GPC light shaper for speckle-free one- and two- photon contiguous pattern excitation," *Opt. Express* 22, 5299–5310 (2014).
8. A. Bañas, O. Kopylov, M. Villangca, D. Palima, and J. Glückstad, "GPC Light Shaper: static and dynamic experimental demonstrations," *Opt. Express* (2014).
9. O. Kopylov, A. Bañas, M. Villangca, and D. Palima, "GPC light shaping a supercontinuum source," *Opt. Express* 23, 1894–1905 (2015).
10. M. Villangca, A. Bañas, D. Palima, and J. Glückstad, "GPC-enhanced read-out of holograms". *Optics Communications*, 351, 121-127 (2015).
11. P. Rodrigo, V. Daria, and J. Glückstad, "Four-dimensional optical manipulation of colloidal particles". *Applied Physics Letters*, 86 (7), 074103 (2005).