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Spin Angular Momentum Of Light In Digital Histopathology

Igor Meglinski
College of Engineering & Physical Sciences, Aston University, Birmingham, UK

In the last decade, consistent and successful innovations have been achieved in the field of lasers and optics, collectively known as 'photonics', founding new practical applications from space (by NASA) to modern biology, medicine and consumer good devices, offering since recently the wearable gear (e.g. Apple Watch). While the global photonics market has reached nowadays €600 billion, only 20% of the potential power and benefits of light technologies have been unlocked so far. Light can be more complicated and structurally diverse, i.e. the light beams can be radially or azimuthally polarized, carrying so-called spin angular momentum (SAM) and orbital angular momentum (OAM), related to their spatial structure. While using the polarization of light in various biomedical applications has already known for years, the interaction of SAM/OAM light with cells has not yet been explored, and has been added to the potential practical toolkit only recently. We examine the use of fundamental properties of complex structured light with the ultimate aim to develop novel non-invasive optical diagnosis of cells and biological tissues with the highest possible sensitivity. With the systematic investigation of influence of cell structure malformation on the SAM and/or OAM of light and their changes due to multiple scattering we develop robust experimental systems/approaches suitable for routine clinical applications. In current presentation we introduce an automated stand-alone approach for segmentation of the abnormal regions in paraffin-embedded tissue block that are in good agreement with the ground truth provided by standard pathological analysis. The proposed approach provides a high potential to revolutionize routine procedures in frame of current practice of histological clinical tests.

Biography

Igor Meglinski is Professor in Biophotonics and Biomedical Engineering at Aston University (UK) and University of Oulu (Finland). His research interests lie at the interface between physics, biomedical engineering, medicine and life sciences, focusing on the development of new non-invasive imaging/diagnostic techniques. His recent main contributions include a number of pioneering studies/results on propagation and localization of light in biological tissues, use circularly polarized light and since recently vortices and twisted light for optical biopsy/histopathology, and the study of light scattering in non-ergodic tissue-like scattering medium. He published over 350 papers in peer-reviewed scientific journals (185), proceedings of conferences (161), book chapters (17) and 4 books, and delivered over 750 presentations at the major international conferences, symposia and workshops, including 30 keynotes and 187 invited lectures, and 88 invited lectures/seminars at the world leading research centres and the universities for students and young researchers. He is the Node Leader in Biophotonics4Life Worldwide Consortium (BP4L), Senior Member of IEEE, Chartered Physicist (CPhys), Chartered Engineer (CEng), Fellow of Institute of Physics and Fellow of SPIE.

SESSION SPEAKER