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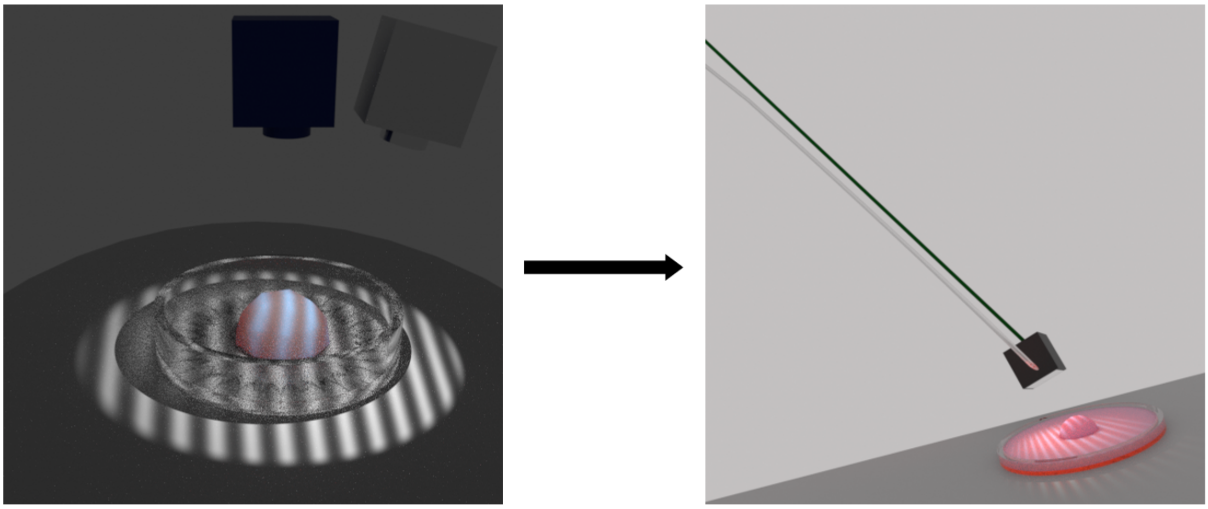
OPTICS & PHOTONICS
UNIVERSITY OF NOTTINGHAM

Optics and Photonics Group Lunchtime Seminar

“Clinically translatable spatial frequency domain imaging towards improved detection of gastrointestinal cancers”

Jane Crowley

Optics and Photonics Group



13:30 Wednesday 8 March 2023
Coates Building - C24
All Welcome

http://optics.eee.nottingham.ac.uk/wiki/Seminars_2022-2023

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MS Teams link

The low five year-survival rates for gastrointestinal cancers evidences a strong clinical need to improve their early detection. Current imaging methods for early detection are expensive and rely on white light imaging which lacks sufficient contrast to spot a wide range of potential tumours. Changes in absorption and reduced scattering coefficients can be linked to pre-cancerous abnormalities in the oesophagus, such as Barrett’s Oesophagus. Spatial Frequency Domain Imaging (SFDI) is a low-cost imaging technique from which quantitative maps of absorption and reduced scattering coefficients may be obtained using structured illumination. We have developed a bench top SFDI system to image fabricated tissue mimicking co-polymer in oil phantoms of biologically relevant absorption and scattering properties. To aid in the miniaturisation of this system towards a clinically translatable device, we have designed and simulated a realistic SFDI system in the open-source 3D rendering software Blender. This tool is capable of simulating turbid media with realistic optical properties in a wide variety of shapes and sizes, within realistic imaging geometries (e.g. inside a tube mimicking the gastrointestinal tract). The simulation aims to accelerate the design and fabrication of new SFDI systems, and to validate system performance under a wide range of realistic imaging scenarios. Finally, we have developed an ultra-miniaturised SFDI system using optical fibers (0.125 mm diameter) to project structured illumination and a miniature camera (< 1 mm diameter) to capture the pattern response for a sample under test. The total package could therefore be made $<$ 1.1mm diameter, representing, to the best of our knowledge, the smallest full SFDI probe achieved to date. We have demonstrated recovery of absorption and reduced scattering maps with our system for phantoms equivalent to that measured in the bench top system. This technology represents a first step towards a less-invasive, cost-effective device which produces close to real-time absorption and reduced scattering maps for improved in vivo disease detection of the gastrointestinal tract.