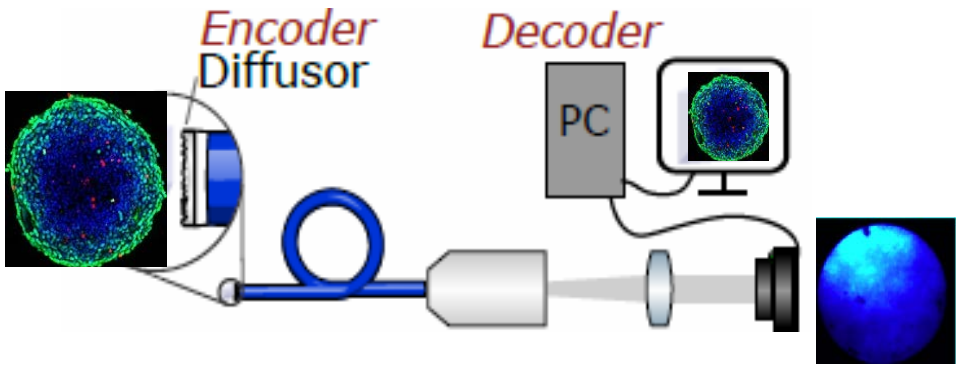
Studienartbeit / Diplomarbeit, ET/MT/RES/MB/IST/Physik

Neural-network-based decoding of speckle patterns for 3D endomicroscopy

Motivation

Diffuser based imaging is a recent topic in computational optics. The diffuser generates a unique pseudorandom speckle pattern for every point within a volumetric field-of-view on an image plane. By solving the inverse problem, the 3D scene can be reconstructed computationally. In conjunction with imaging waveguides, this enables the realization of single shot 3D micro-endoscopes. For this purpose, the diffuser is placed in front of the waveguide to code the 3D object into a 2D speckle pattern, which is then transferred and read out by a camera. The image reconstruction is performed by a neural network at video rate.

3D imaging was already performed at fluorescence particles. Next, the setup shall be improved to image more complex objects like biological tissue.



Possible Tasks

- Neural network architecture improvement (physics informed)
- Diffuser property improvement (phase mask design, 3D printing)
- Illumination improvement (structured illumination)

Key words

Endoscopy, neural network, computational optics

Kontakt

- Dipl.-Ing. Tom Glosemeyer, E-Mail: julian.lich@tu-dresden.de
- Internet: tu-dresden.de/et/mst