Universität Augsburg
Fakultät für Angewandte Informatik

Laser Speckle Imaging

Biophotonics – Exercise 4

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Agenda

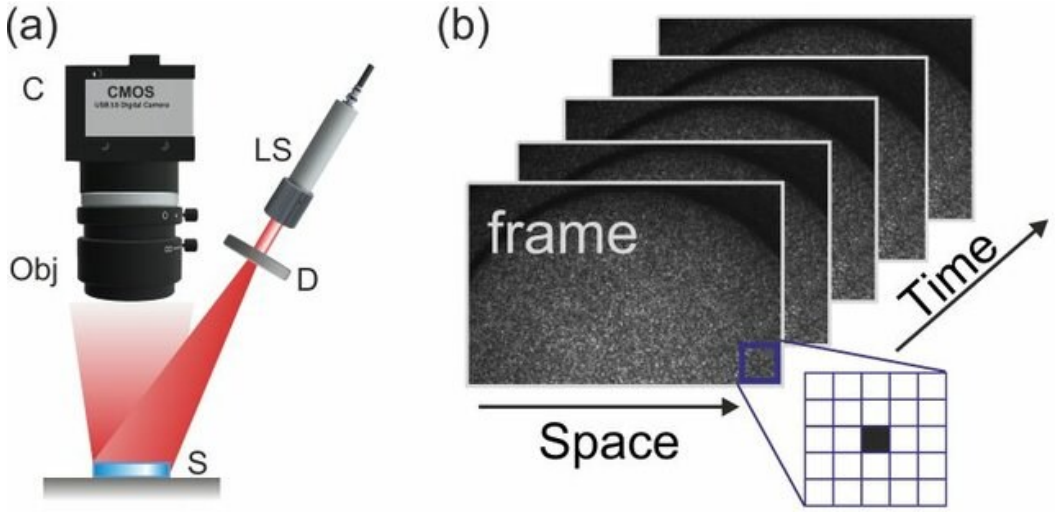
1. Laser Speckle Contrast Imaging
2. Device
3. Applications
4. Exercise

Laser Speckle Contrast Imaging

Theory

- Scattering of light while interaction with tissue
- Dependant on optical properties of tissue
- Strength of perfusion changes optical properties

- Quantify perfusion by measuring temporal variations in the speckle pattern (Flux)

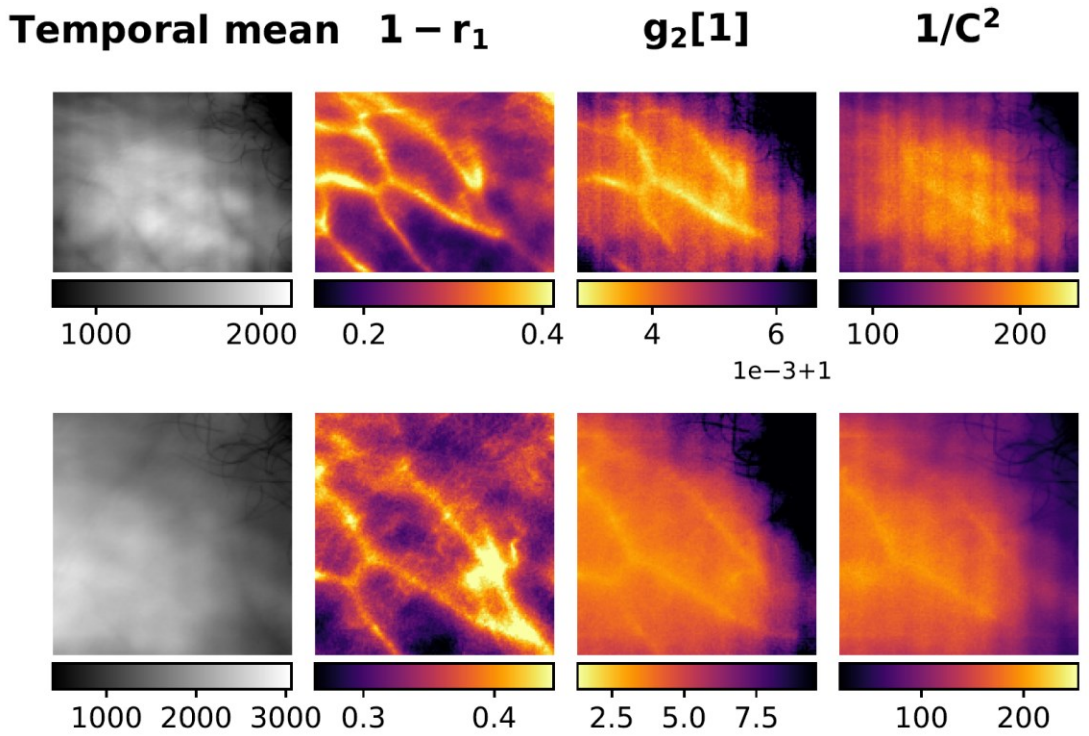


http://dx.doi.org/10.1117/12.2306631

Laser Speckle Contrast Imaging

Theory

- Various algorithms to calculate flux data
  - Temporal Contrast
  - Autocorrelation
  - Zero-crossing
  - …



https://doi.org/10.1364/oe.452111

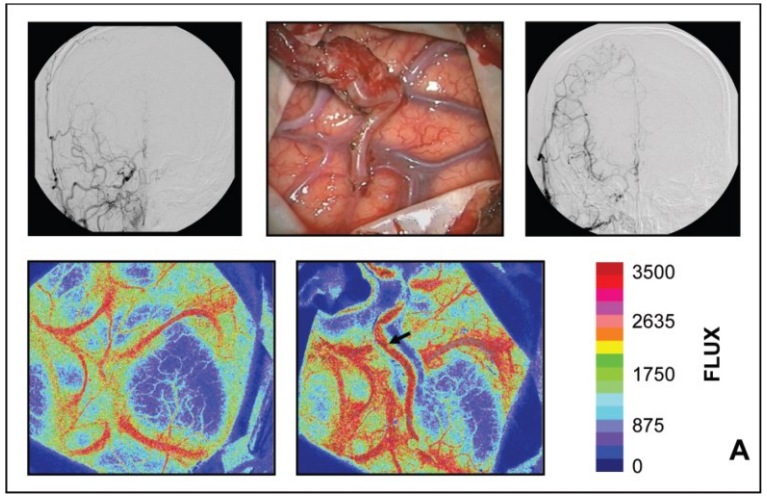
Device

Moor FLPI-2

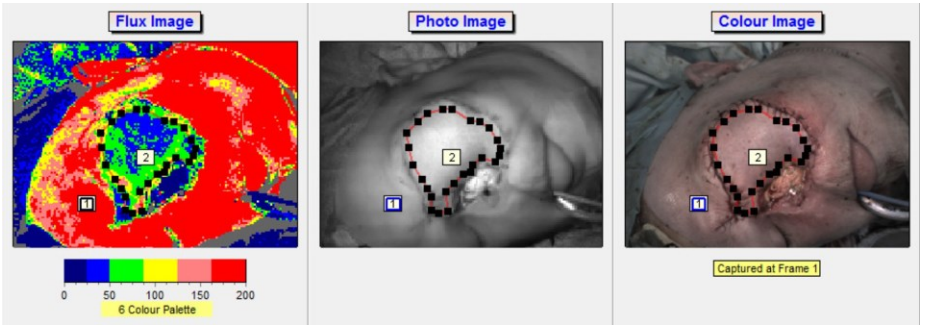
- NIR laser (785 nm), Class 1
- Industry camera (Basler acA2040-120um),
  120 fps
  2048 x 1536 px
- Professional software features different recording presets, ROI selection, evaluation algorithms, …

Applications

- Intraoperative cerebral blood flow monitoring
- Monitoring of revascularization
- Monitoring of tissue perfusion after tissue transfer
- Inflammation and irritancy research



https://doi.org/10.3171/2009.8.FOCUS09148



https://doi.org/10.1016/j.bjoms.2018.03.023

Exercise

- Design small-scale study
- Control industry camera via python API
- Record your experiment
- Image/video processing
- Calculation and evaluation of LSI data

- Stimulation of perfusion:
  - Finalgon
  - Capsaicin
  - Cooling pads
  - Heating pads
  - … own ideas?

Due date: Sunday 02/02/2025, 23:59

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