

Subject

Development of an optical instrument based on time-domain diffuse correlation spectroscopy (TD-DCS) technique to obtain path-resolved blood flow changes in biological tissues

Supervisors, contact, place of research

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Project Description

Diffuse optics is a growing subfield of biomedical optics which aim is to investigate physiological parameters, such as a blood oxygen saturation, and tissue blood flow. Diffuse correlation spectroscopy (DCS) is one of the non-invasive diffuse optical techniques, which enables to directly measure blood flow in the tissue by utilizing continuous wave laser light [1]. Recently, time-domain DCS (TD-DCS) was introduced, which allows to obtain blood flow at different depths [2].

The aim of this Ph.D. program is to develop a compact and portable optical instrument based on TD-DCS technique to assess path-resolved blood flow changes in the biological tissue. The program is divided into four main stages. At the first stage, the TD-DCS system will be implemented in a frame of a compact and portable instrument. Next, during a series of measurements on optical phantoms, the capability of the system to measure the blood flow changes at different depths, and furthermore to estimate optical properties of the turbid media according to the prevalent methods [3], will be investigated. The third stage will be related to evaluation of the system performance by comparison with other available instruments. Finally, the developed TD-DCS instrument will be employed in a series of *in vivo* measurements on healthy volunteers.

Bibliography

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- [2] Sutin, Jason, et al. "Time-domain diffuse correlation spectroscopy." *Optica* 3.9 (2016): 1006-1013.
- [3] Liebert, Adam, et al. "Evaluation of optical properties of highly scattering media by moments of distributions of times of flight of photons." *Applied optics* 42.28 (2003): 5785-5792.

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