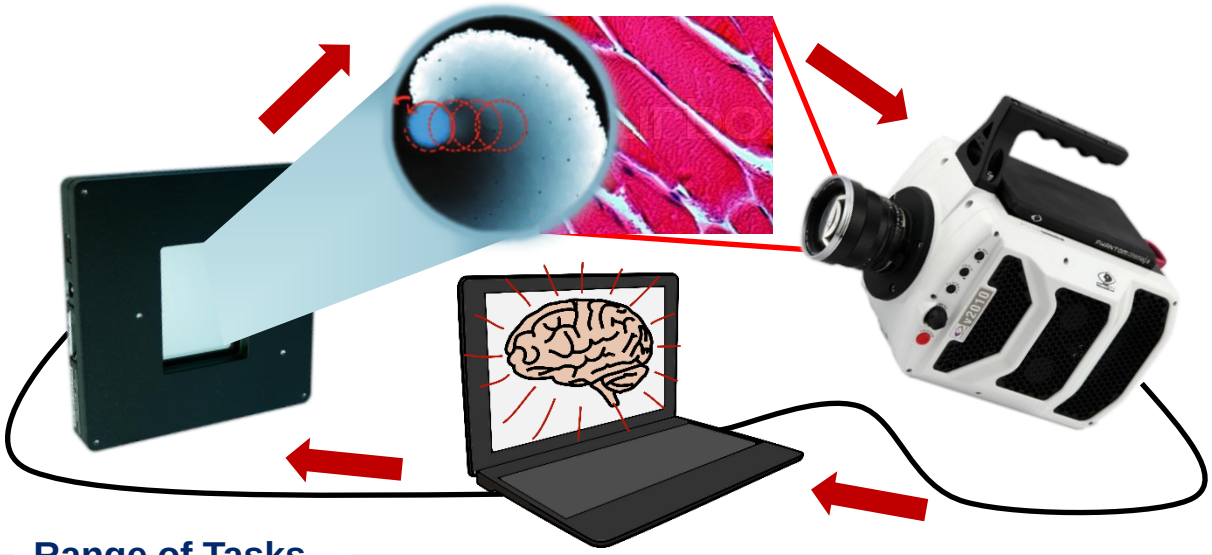
Bachelor / Master Thesis

Light-based heart contraction control *in vitro*



Motivation

Background:
Too high, too low or irregular heart beat frequencies can lead to the death of affected persons. Established treatments for too high heart frequencies using electrical pacemakers are often very painful for patients. Here, optogenetics, a toolset for the control of genetically sensitized cells‘ activity using light, offers a potential pathway to less painful treatment and the understanding of the origins of arrhythmia.

Tasks:
The goal of this work is the creation of an optical system for the stimulation and inhibition of cell activity using light and the testing of the system with cardiac organoids (organ-like cell clusters). The main focus is on setting up a closed loop control for heart activity comprising the optical stimulation/inhibition system, the optical observation of cell contractions and cell excitation wavefronts as well as an image processing control system using PC/FPGA for the calculation of new stimulation patterns.

Range of Tasks

- Characterization of an optical system for the stimulation/inhibition of cell activity
- Light-based creation of excitation wavefronts in cardiomyocyte (heart muscle cell) clusters
- Control of excitation wavefront propagation in a closed loop control

Related Topics

Systems control, Systems engineering, Image processing, Optics, Optogenetics, Biomedicine

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