University of Basel
Department of
Biomedical Engineering

University of Basel, Department of Biomedical Engineering, Gewerbestrasse 14, 4123 Allschwil

Master of Science – Biomedical Engineering
Thesis Proposal

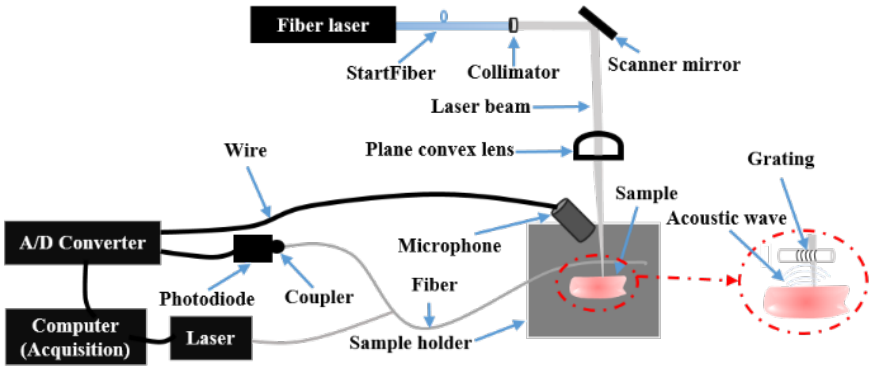
Optoacoustic Tissue Classification for Laser Osteotomes using a Fiber Bragg Grating

BLOG (Biomedical Laser and Optics Group) develops a fiber based laser with feedback system which guarantees for extremely precise cuts of almost all shapes in minimal invasive surgery. Currently, bone saws can only achieve medium precision, which is connected to relatively reduced implant stability and relatively longer recovery times. BLOG´s fiber laser will enable controlled contactless bone ablation leading to faster bone healing and less thermal damage compared to conventional mechanical osteotomes. To further extend the advantages of laserosteotomes over conventional osteotomes, also real-time opto-acoustical feedback sensor on type of tissues being cut would be desirable to immediately shut down the laser in case there is no bone tissue left to cut.

The aim of this master thesis project is to ablate hard and soft bone, muscle, fat and skin tissues using an nanosecond Nd:YAG laser at 532 nm and/or a microsecond pulsed Er:YAG laser at 2.94 µm. The student will measure the emitted acoustic shock wave using an optoacoustic sensor-based Fiber Bragg grating system. He will also compare the performances of principal component analysis (PCA) combined with a Mahalanobis distance method and the one for PCA combined with cubic support vector machine method using both lasers. Other methods for tissue classifications are also welcome. An alternative will be to use the fiber Perot sensor.

Nature of the Thesis
Experimental: 40%
Programming: 40%
Documentation: 10%

Specific Requirements
Experience with optoelectronics engineering, applied Physics, Matlab and signal processing would be helpful



Supervisors
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