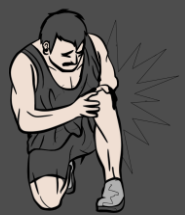
OCT-Based Adaptive Orientation Control

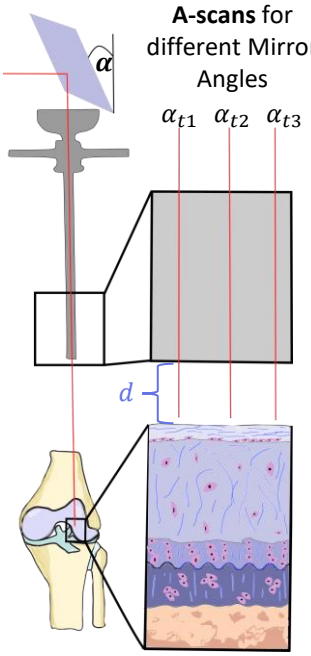
Master Thesis

Joint injuries and cartilage degeneration affect millions worldwide, causing pain and reduced mobility. The **LAROCARE (Laser-Assisted RObot-guided CArtilage REgeneration)** project uses a combination of robotics and laser technology to enable precise restoration of cartilage in the knee.

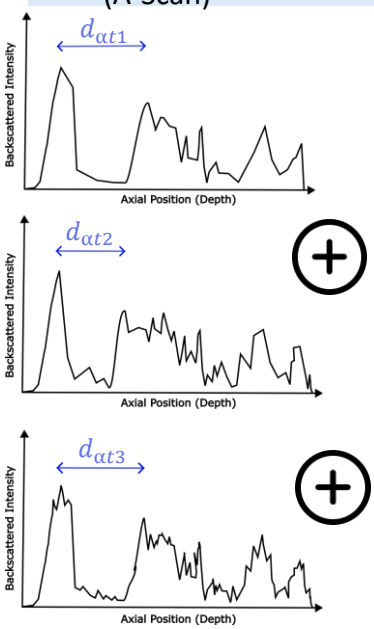


This project focuses on estimating the local surface normal $\vec{n}$ and the end-effector-to-tissue distance d. $\vec{n}$ and d provide the feedback required for a task-space controller. This aims to ensure **precise, and repeatable laser ablation**, even on curved or dynamically varying tissue surfaces.

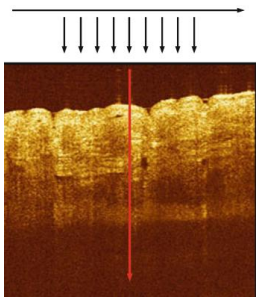
OCT Scanning: Axial (Z) and Transverse (X) with a Galvanometric Mirror



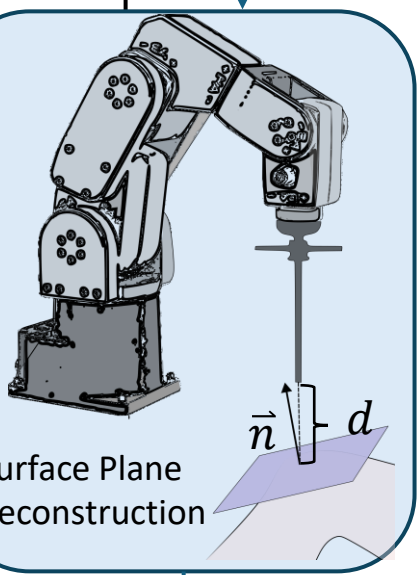
Axial Scan (A-Scan)

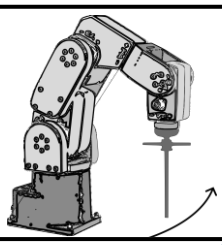


Cross-Sectional Scan (B-Scan)



A-scans @ ~100kHz
B-scans @ ~250Hz





Task Space Positions & Velocities

$\vec{x}, \dot{\vec{x}}$

@ 1kHz, $|\dot{\vec{x}}| < 5\frac{mm}{s}$

Apply to this project by email. Send us (jan.schimmelpfennig@unibas.ch) your **CV**, and **diplomas**, and **course transcripts**.

On-Site or Remote

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