

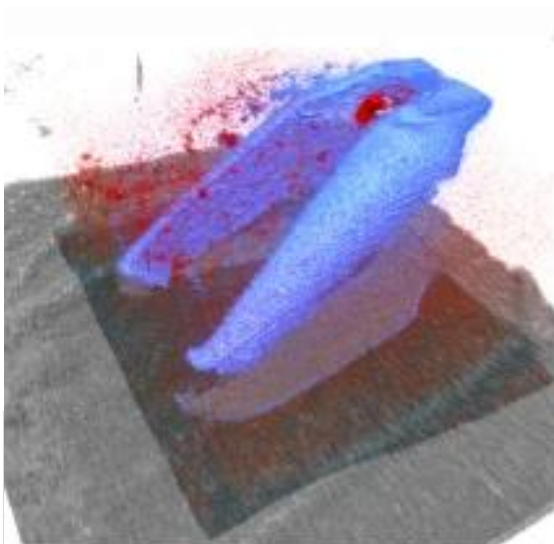
Volume Fusion for 4D Intraoperative Optical Coherence Tomography

Project Management and Software Development
for Medical Applications

General Info

Contact Person: Michael Sommersperger

Contact Email: michael.sommersperger@tum.de



Project Abstract

Intraoperative Optical Coherence Tomography (iOCT) has the potential to acquire real-time volumetric data during eye surgeries. Despite this data provides high resolution imaging, the field of view is limited. To cope for these shortcomings, the acquired volumes can be fused to acquire a bigger field-of-view scene that continuously extends with new data being collected.

Background and Motivation

Intraoperative Optical Coherence Tomography (iOCT) is a medical imaging technology that can acquire 2D and 3D scans at micron-level resolution. Due to its potential for fast scan acquisition, it has been integrated into operating microscopes to acquire real-time imaging of

microsurgical instruments and anatomical tissue. A particular application domain is retinal eye surgery. Delicate maneuvers at an operating area of only few millimeters require extreme dexterity and high-resolution visualization. While iOCT brings the necessary resolution, it's limitations in field-of-view restricts the potential applications. Fusing these small field-of-view volumes can generate a bigger imaging area, which extends over time with new acquired data and generates a more complete surgical scene in a 3D volume representation, where old data is updated with the more recently acquired data.

Student's Tasks Description

The student will be given a set of 3D iOCT data and an existing software framework for data loading and visualization in Unity 3D. The task of the student consists of implementing loading functionality of multiple volumes and the subsequent volume fusion in Unity on the GPU using C# and HLSL.

Technical Prerequisites

The student should be familiar with Unity and C#. Knowledge of rendering in Unity and HLSL is beneficial.

References

[1] <https://unity.com>