Depth estimation on RGB laparoscopic images

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

Depth estimation of RGB images has been broadly developed in the last years. This intuitive task for humans is, however, very challenging for a machine. Furthermore, this gets even harder for setups like laparoscopic imaging. The huge amount of deformations and changes in light and tissue properties hinder depth estimation for this setup. The use of Deep Learning has shown to work for this task. The main requirement, the huge amount of labeled data, has already been addressed on a PMSD project last semester.

First, several laparoscopic videos were recorded on real surgeries. Second, a commercial tool is used to generate a 3D textured mesh of the abdominal cavity. Third, a software pipeline based on BlenderProc is used to create a artificial RGBD images from given textured meshes. This setup allows to easily create a huge dataset that can be used to train several models

Student's Tasks Description

- Install and configure the aforementioned pipeline for the creation of the dataset.
- Generate an artifitial dataset from several videos.
- Train and develop several DL models for Depth detection on laparoscopic RGB images

Technical Prerequisites

- C++/python.
- Tensorflow/ Pytorch
- Linux (Ubuntu) basic knowledge can be helpful.

References

[1] BlenderProc, Maximilian Denninger and Martin Sundermeyer and Dominik Winkelbauer and Youssef Zidan and Dmitry Olefir and Mohamad Elbadrawy and Ahsan Lodhi and Harinandan Katam.
[2] https://github.com/DLR-RM/BlenderProc
[3] https://alicevision.org/

Please send the completed proposal to javier.esteban@tum.de, ardit.ramadani@tum.de mf.azampour@tum.de and zl.jiang@tum.de. The proposal will be evaluated by the BMC coordinators and assigned to a student only in case of acceptance.