The design of a validation experiment for the Tissue Active SLAM model

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BSc Report

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1 Summary

In 2018, only 2.1 million female breast cancers were diagnosed worldwide. The MURAB project has the ambition to improve precision and effectiveness of breast cancer biopsy. This report is about the validation of the Tissue Active SLAM method, which is part of the MURAB project. The TAS model generates a 3D volume of the tissue equal to the preoperational MRI using ultrasound, where the deformation is taken into account. Second, the location of the ultrasound transducer is tracked.

In this study, an experiment is designed which could be used to validate the Tissue Active SLAM model.

To validation of the Tissue Active SLAM model, an experiment is designed, set-up and implemented. This experiment contained a self-made phantom whereof the 3D volume, the deformation and the location of the ultrasound transducer were measured. 3D volumes were constructed with the use of MRI and with the KUKA ultrasound robot. With the KUKA ultrasound robot, multiple measurements with each a different pressure size were performed on the phantom. References were placed in the phantom which could be seen on the MRI and ultrasound images. Two electromagnetic trackers were used to measure the exact deformation, placed on two different locations. These trackers were also used to measure the determine the location of the transducer.

There can be concluded that it is possible to design a experiment which is usable to validate the Tissue Active SLAM model. Also are the results of this experiment almost in its entirety usable for the comparisons with the TAS model. The deformation calculation of the ultrasound images in the results are not correct, because the deformation measurements are compared with the 2mm measurement instead of the reference.