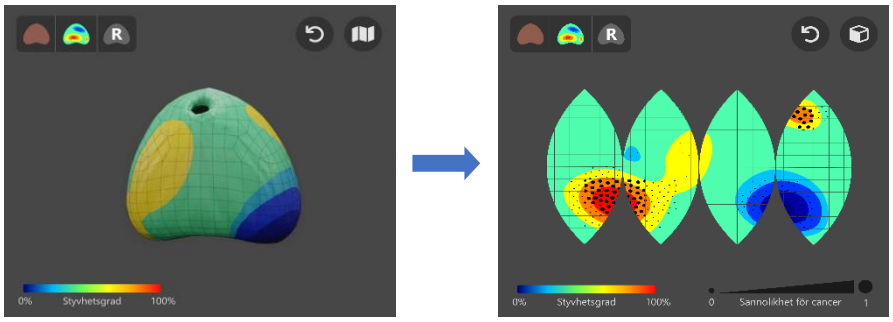
Degree project 30 hp in Computing Science

3D to 2D Prostate Model Conversion for Cancer Detection

Biomedical Engineering R&D (MT-FoU) is a research and development department at the Center for Information Technology and Biomedical Engineering at Norrland University Hospital, Region Västerbotten. The department conducts international research, development and education in the field of biomedical engineering, with expertise in, for example, sensors and measurement systems, image and signal analysis and biomechanical models. MT-FoU is also a part of the competence center AI for Medicine in Northern Sweden, AIM North, which supports clinical research projects with technical method expertise in machine learning and AI.

Background

Prostate cancer (PCa) is the second most common form of cancer among men – in Sweden alone, 10101 men were diagnosed with PCa in 2021. The most common curative treatment is the surgical removal of the prostate. To ensure that all cancerous tissue is removed during the operation, we are developing a prostate scanner (ProScan) that can detect cancer cells on the surface of the prostate by combining stiffness measurement with resonance technology and tissue characterization with Raman spectroscopy. This is part of a research project together with pathologists and urologists to refine the development for clinical use. In the proposed software designed to visualize the measurement progress and results, a 3D model of the prostate gland will be constructed. To provide a better overview of the entire surface of the prostate, we aim to implement functionality that converts the model from 3D space to 2D.



3D model of the prostate gland. 2D projection of the same prostate gland.

Aim of the project

The aim of this thesis is to develop and implement a method for converting a 3D model of the prostate gland into a 2D visualization. This “map view” of the prostate will help users gain a complete overview of the entire surface and ease the identification of potential cancer cells. A key challenge is to address geometric distortion due to the irregular shape of the prostate, ensuring the 2D representation is accurate and useful.

Work description

The project includes:

- **Method Development**: Investigate and implement an algorithm to convert the 3D model into a 2D visualization.
- **Visualization**: Integrate the method into software that allows switching between 3D and 2D views.
- **Validation**: Test and validate the accuracy and usability of the method by comparing it with existing measurements of the prostate gland.

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