

Optimised operator-independent 3D breast tumor imaging

Advisors:

Béatrice Walker (Beatrice.walker@inserm.fr)

Host Laboratory:

Affiliation: INSERM

Lab Name : Institute Physics for Medicine Paris

Address : 2-10, rue d'Oradour sur Glane 75015 Paris

Project description :

Breast cancer will affect one in every 10 woman in their lifetime, and efforts to improve breast cancer management are therefore a national priority. This project is part of MUSCAD, an ERC funded project aiming to provide a non-invasive alternative to biopsies, using ultrasound imaging. In MUSCAD, a clinical device is being built to capture images of tissue anatomy, elasticity, blood flow and tissue structure to provide characterization of breast tumors, with a single ultrasound probe. One of the issues to address is the operator-dependence of ultrasound imaging, which leads to non-reproducible clinical examination and can yield variable diagnoses.

This project aims to propose an automatic acquisition system using a surgical arm to fix the probe in place once positioned, and a rotation motor to perform the acquisitions. The challenges to address in this internship are to adapt the motor to the arm and probe, and to the already available clinical prototype in an optimal way. In addition, a previous probe holder design allowing for motion compensation will be included in the final assembly, which will requires some more adaptation.

Main tasks

The trainee will be asked to:

- Learn to control the rotational motor via a computer interface
- Design an assembly combining the surgical arm, motor and probe
- Build the probe holder and any other necessary parts using 3D printing machines in our facilities
- Propose a design embedding the motion correction into the first assembly
- Propose an upgrade of the original motion compensation device addressing the motion in all directions
- Test the automatic acquisition and validate the image quality in-vitro and in-vivo on healthy volunteers

Work environment

The trainee will be part of a dynamic team including two other trainees and two PhD students, one of which is involved in building the ultrasound device, and will be helping with the data acquisition,

phantom generation and motion correction algorithms. A wide range of machines (3D printers of different types, soldering station, toolshed) and materials (hard or flexible plastic, metal, resins) are available at the laboratory, and funding is available to purchase any custom item required.

The trainee's work will be implemented in the clinically validated device and subsequently used at Institut Curie for the imaging of 500 patients. It can also lead to a patent depending on the design chosen.

Required skills and knowledge

- Matlab programming
- Mechanics and electronics
- 3D printing/ CAD
- Proficient english, communication and writing skills
- Initiative and teamwork

How to apply

Please send your CV and cover letter to beatrice.walker@inserm.fr