

Internship:

Intraoperative registration for magnetic micro robotic injection in knee osteoarthritis treatment

Keywords:

Medical Image Analysis, Registration, Computer Vision

Born from the complementarity between the field of health and communication sciences, the LaTIM is a research lab which leads multidisciplinary research driven by scientists, engineers, and physicians from the University of Brest, IMT Atlantique, INSERM and the University Hospital of Brest. Medical information is at the heart of our research projects; being by nature multimodal, complex, heterogeneous, shared and distributed, it is integrated into methodological solutions and transferred into the clinical community with the sole aim of improving the medical benefit.

Interested to be involved in a research project combining computer vision and medicine?

Context

The targeted delivery of drugs to human body parts, the manipulation of micro-organisms, as well as assisted micro-injection are promising applications of micro robotics in the medical field. Among these applications, cell therapy for bone cartilage repair is a promising treatment that avoids heavy bone grafts in mobile knee joints. This procedure, performed under arthroscopy, consists of injecting mesenchymal stem cells (MSCs) which allow the regeneration of bone cartilage. However, it is very difficult to precisely target these cells to the damaged cartilage area, mainly due to the reduced field of view of the arthroscopic images and the lack of precision in the injection procedure. It is therefore important to be able to guide the surgeon in the injection of these cells to improve the clinical effectiveness of this treatment. As part of a research project, a non-invasive solution has been developed by our partner, the PRISM laboratory from INSA Centre Val de Loire. This solution consists of injecting magnetic microparticles functionalized with these MSCs to control their displacement in real time towards the damaged cartilage using a magnetic robotic system. A preoperative model of the damaged cartilage is available. The objective of this internship is to address the problem of the registration of this model using intra-articular arthroscopic images.

In collaboration with the PRISME laboratory, this work will be divided into 3 steps.

1. Carry out a state of the art on all the techniques used to make registration based on arthroscopic images to position our contributions and define the specifications of our solution.
2. Develop a solution allowing the intraoperative registration of this preoperative model.
3. Validate the approach in a realistic preclinical environment, through the PLaTIMed platform available at the LaTIM.

Profile

- Master 2 or last year engineering student in Computer Science / Computer Vision / Biomedical engineering.
- C++/Python programming skills and experience with 3D modelling or Image processing knowledge.
- Ability to deliver documented code and present results to the team.
- Ability to read scientific articles and extract relevant information.

Conditions

Start date: February / March 2024

Duration: 6 months, indemnities, PhD opportunity on this topic at the end of this internship

Localization: LATIM – University Hospital of Brest – 2, avenue Foch – 29200 BREST – France

Supervisors: A. GUEZOU-PHILIPPE, associate professor, IMT Atlantique, G. DARDENNE, research scientist, INSERM.

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