

Master / PFE Internship

4D quantitative and dynamic ultrasound imaging

As part of its business, ID4US is developing a breakthrough technology for biometric sensors based on ultrasonic modalities (4D UltraSon Identification) for secure and robust solutions. It integrates sensors, integrated circuits (ASICs) and specific software. The aim is to develop a complete solution for detecting and characterising dynamic phenomena.

The Creatis laboratory and ID4US have identified several areas for development, including acquiring the ultrasound signature of fingerprints and subcutaneous tissue. A functional prototype (hardware + software) already exists and has enabled a global solution to be quantified (hardware solution and integration, ergonomics and acquisition time, etc.). However, many areas remain to be studied, particularly in relation to the interactions between ultrasound and complex biological tissues. Thus, during the course, it is planned to work on various points that have not yet been studied:

- Effects of "biological movements" on temporal signals
- Detection and classification of specific signatures
- Multi-method approach (fusion of data from different techniques, etc.)
- Prototyping (software and hardware), production of test vehicles for characterisation...

Using the current solution (prototype and imaging sequence), the candidate will have to quantify the biological movements present and propose a measurement of potential biological markers of interest (vascularisation, ultrasound tissue statistics, backscatter coefficient, quantitative imaging, etc.). Therefore, a study of the state of the art will be necessary to measure their interest in the project's context and the potential for use and development for ID4US. The ultrasound sensor, which provides 4D (3D+t) imaging, opens up a wide range of unexploited possibilities that must be referenced and tested.

To validate the approaches identified, Creatis and ID4US have access to open research ultrasound scanners for controlling the biometric sensor that will be made available to the trainee during the project. In this way, all stages of the ultrasound acquisition chain will be accessible: transmission, reception, beamforming and post-processing. It will thus be possible to assess the benefits of each approach and, in conjunction with the company, the potential cost of the final solution it could develop.

The objectives of this internship

- Propose a measurement of dynamic/quantitative phenomena in biometry
- Quantify the quantification and amplitude of biological movements present during the acquisition
- Experimentally implement the measurement and the necessary imaging sequences using the company's sensor

General information

Profile: Student from a top engineering school or research master's degree (generalist or EEA profile)

Main skills: Signal processing, physical sciences, experimental skills and laboratory work

Soft skills: Versatility and curiosity, ability to work independently, initiative, good written and oral communication skills.

Start and duration of placement: February/March 2024 for a period of 6 months.

Placement: Creatis, la Doua campus. One journey per month is to be planned within the company in Grenoble.

Depending on the developments and results of this initial work, a PhD may be envisaged in conjunction with ID4US.

Application

Send CV + cover letter+ M1/M2 or engineering school transcripts to:

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