

Development of a robust prototype for measuring the knee vibroarthrosopy

Master project

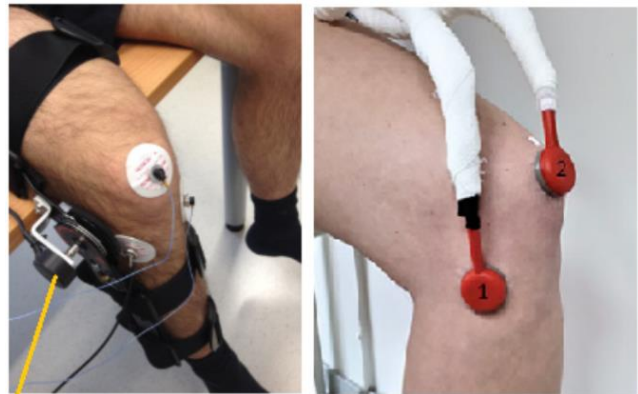
Tutors: Michal Ruzek (Michal.ruzek@insa-lyon.fr, Lamcos), Simon Lambert (Ampere)

Context

Knee problems represent a very common source health issues for the world's population. Among more than one hundred of known knee ailments, the osteoarthritis is the most common and unfortunately very impactful disease which reduces the quality of life of patients. Although many screening techniques exist for the investigation of the knee joint, most of them are based on a static image obtained from waves propagating through the articulation (X-rays, MRI, ultrasound etc). Although useful information is obtained, the dynamic aspect, i.e. the knee in motion, is not addressed by these methods. The knee vibroarthography is inspired by a similar well-known method of heart auscultation. It is based on the belief that the knee health may also reflect on its noise signals coming from the knee in motion. Albeit a relatively old method, it only comes into prominence in the last decades with possibility to record and process the noise generated by the knee joint.

Project

Today, several systems for measuring the knee noise have been tested in laboratory with success. Their usage is, however, rather limited in a medical environment where robustness, reliability and ease of use are the key. We wish to proceed to collecting larger datasets in the hospitals with real patients, but we need to develop a suitable measuring tool first. The development and testing of this tool is the main purpose of this project. It would be undertaken conjointly in the Lamcos and Ampere laboratories. Some preceding examples of the measurement are shown in the right figure.



Expected outcomes

We expect the functional prototype of the sensor to be designed, built, and tested successfully during this project. A necessary documentation and sufficient dataset of measurements showing the scope of the application are required.

Profile

A student interested to work in medical technology. A basic knowledge of mechanical and/or electrical engineering is necessary. An experience from the medical domain is welcome.

Literature

Open source:

De Tocqueville, S.: A Review of the Vibration Arthrography Technique Applied to the Knee Diagnostics

<https://www.mdpi.com/2076-3417/11/16/733>