



Sujet :

Optimal dielectric materials for tactile microsensors for use in artificial electronic skin

Niveau : Bac + 5 (3^{ème} année d'école d'ingénieur – Master)

Durée du stage : 6 mois

Résumé.

The field of robotics today is continuously expanding from the fixed environment of a production line to include more complex environments such as homes, offices, and hospitals. The new application areas require versatile autonomous intelligent robots that can interact with humans and their wide range of tools in real-world environments. To intelligently perform in unstructured and changing surroundings, robots will be required to grasp, handle and manipulate objects while simultaneously sensing and reasoning about their environment. To achieve this, robots need an interface that can provide information about the forces and positions at all points of contact between them and the objects they are interacting with. A key issue in robotics today is therefore the development of artificial skin interfaces for robots with fully distributed tactile sensing.

The HANDLE project is a European project with nine partners from six countries. The project aims at understanding how humans manipulate objects in order to replicate human in-hand movements with an anthropomorphic robot hand. The contribution of LIS in HANDLE is the development of an artificial skin with tactile sensing for the robot hand. Here, the tactile information that is gathered by the artificial skin will be used to determine if the robot is in contact with an object, and the shape and type of the object. The information will also be used to analyse and control the robot's object manipulation to optimise its handling techniques, increasing its versatility, skills and performance.

The tactile sensors developed by LIS are microsensors based on the capacitive effect and are fabricated using advanced microfabrication techniques. Further miniaturization and optimization are required to achieve state-of-the-art tactile sensing artificial skin. Alongside the further development of the skin design and microfabrication techniques, a key issue is the optimization of the materials that are used in the sensors.

Objectifs du stage.

The microsensors consist of several layers of different material where each has its function, criteria, and restraints. One of the layers consists of a flexible, stretchable and soft dielectric material. This layer has several restraints concerning its mechanical, chemical and electrical properties in addition to its integration with the other layers in the microsensor. The goal of this project is to identify the optimal dielectric material for use in the capacitive microsensor given the different criteria and restraints.

The project plan can be summarised as follows:

- Identification of materials of interest for tactile sensing skin.
- Fabrication of test structures using the different chosen materials.
- Physical, electrical and chemical material tests.
- Analysis of results and conclusions.



Domaines de spécialité requis : Physique des matériaux, Sciences et technologie des matériaux, Matériaux organique, Matériaux polymérique

Moyens informatiques mis en œuvre :

Autres moyens mis en œuvre (expériences, méthodes d'analyses, autres...)

Knowledge of microfabrication and MEMS techniques advantageous.

Language: As this is an international project, English oral and writing skills are required.

Centre : Fontenay-aux-Roses

Pôle ou Direction : DRT - LIST

Dépt/Service/Labo : DTSI/SRCI/LIS (Laboratoire Interfaces Sensorielles)

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Encadrement

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