

Title

Modeling and control of soft fluidic robots with multiple DoF

Context of the internship

In recent years, there has been an increasing interest in the use of soft robots in different fields such as biomedical and industrial ones, especially through the development of soft manipulators and grippers.

Owing to their soft behavior, they are safe to interact with the surroundings with the ability to apply relatively significant forces and the flexibility to operate in narrow environments. Soft manipulators employ actuators that make them adapt to objects of various shapes and materials.

Objectives

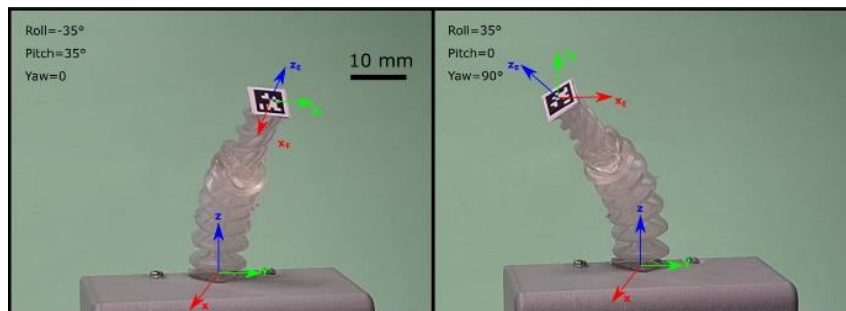


Figure 1 – 3D printed pneumatically actuated soft robot with 3-DoF

Aim of the internship

The strong nonlinearity in the soft mechanisms and their complex structures, analytical modeling is thus challenging. Finite elements modeling (FEM) offers a better solution to handle those nonlinearities and avoids the development of complex explicit analytical models. FEM can be employed to predict performance and evaluate the capabilities and limitations of soft mechanism designs. It can also be used to determine stress concentration and strain distribution to optimize the robot's design. The aim of this internship is to advance in the modeling and control of a soft robot capable of generating 3 Degrees of Freedom (DoF). Multiple robots can be then attached in parallel to grasp and manipulate different types of objects. The robot is pneumatically actuated.

The trainee will mainly work on the following tasks:

- Handling of a simulation platform such as SOFA Framework and preliminary modeling of soft robots. This modeling is required to control the robot.
- Miniaturization of the manipulator (Figure 1)
- Complementary work on the manufacture and control of pneumatic actuators will also be carried out.

The work will take place at the FEMTO-ST institute in Besancon, within the AS2M department (Automation and Micro-Mechatronic Systems). The framework will benefit from the technological platforms of the S.mart platform and the knowledge of the team in design fabrication and control of microrobots. The gratification is at the legal rate (550€/month) for a period of 6 months.

Keywords: micro-robotics, soft robots, modeling, control, microfabrication.

Requirements

The candidate must have an interest in robotics and modeling and have elements of competence in these fields. The concerned scientific domains are robotics, computer science, and engineering sciences.

Supervisors

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How to apply

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