Intradermal and subcutaneous needle insertion with the ROB-ID

Nowadays, in clinical structures and hospitals, personnel like surgeons, physicians, and nursery staff collaborate with advanced machines, medical robots, and devices that can improve patient treatment. Usually, the robots used in the biomedical field are **teleoperated;** hence, there is shared autonomy between the clinician and the robot in executing the task. Still, the research field is trying to push towards **fully autonomous robotic systems** that increase the precision of the task.

Fig.1 ROB-ID, a medical vaccination robot developed by IDEVAX

During the COVID pandemic, humanity was challenged to find new medicines and vaccines to combat the virus and new strategies to organize and manage mass vaccination programs. Hence, it is necessary to develop robotic devices that can manage these challenges in the future.

For these reasons, the Robotics and Multibody Mechanics department of VUB University (**R&MM**) in collaboration with the company **IDEVAX** is seeking a motivated student to perform experiments with the **ROB-ID vaccination robot** (Fig.1), with the goal to have a fine element simulation (in SOFA) for the case of **intradermal and subcutaneous needle insertion of human skin**.

The experiment and the simulation will have the following features:

- ROB-ID supports **different needle geometries** that have to be considered in the experiemnts and in the simulation.
- The needle insertion is at intradermal and subcutaneous layer (fat tissue). A **phantom** that mimics these tissues have to be designed, and in simulation, the mechanical properties of the materials have to be involved.
- The experiments and the simulations will be performed at different penetration depth (from 1 to 3 mm), retrieveing the **force acting on the needle for single and multiple usage** of the same needle.

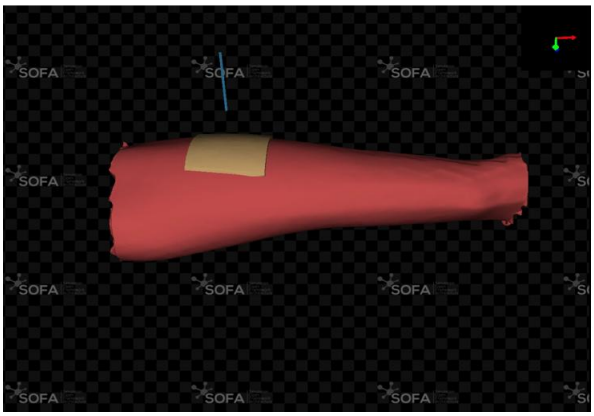

Fig.2 SOFA simulation of an intramuscular needle insertion.

Hence, we are looking for a student who aims to:

- To learn new skills like Python coding and finite element simulations
- To develop a particular interest in the medical robotics field.
- Open to do PhD research in this topic.

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