



Modelling soft robots with SOFA (3 hours)

Contact email : pasquale.ferrentino@vub.be

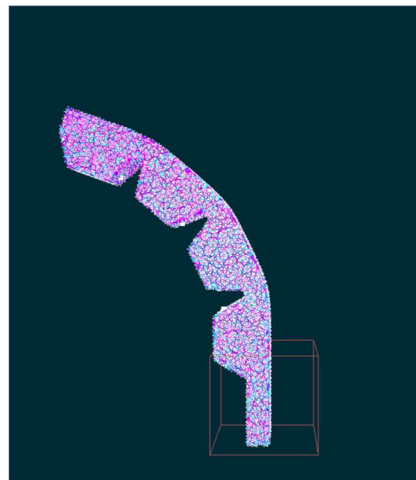
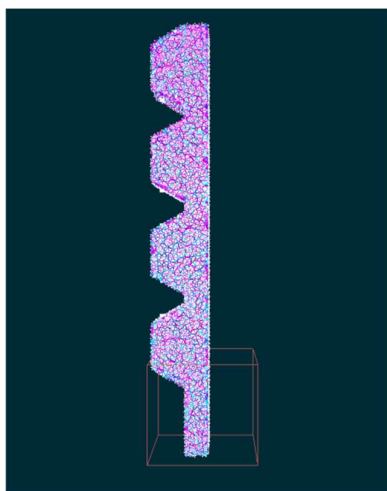
Abstract

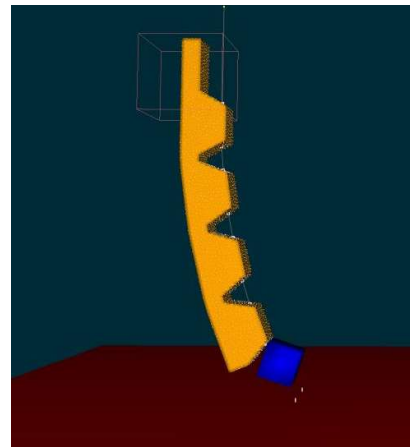
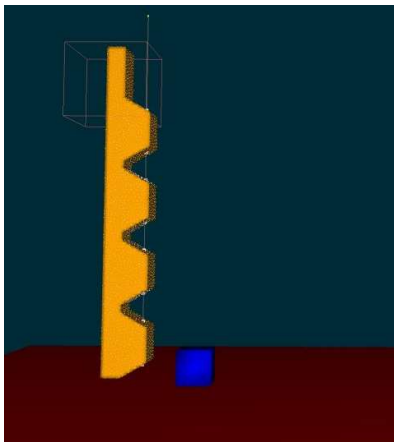
Recent developments in soft robotics and the advances in the material used in this field, revealed the need to have an accurate modelling of the soft continuum robot. One of the techniques commonly used is the *Finite Elements Analysis* (FEA) simulation, that involve the discretization of the continuum mechanics equations in a geometrical mesh that approximates the volume of the object. One of the FEA software mostly used in research for modelling and real-time control is called *Simulation Open Framework Architecture* (SOFA).

The aim of this workshop is to understand how SOFA software works, explaining the working principles, and how to create and animate a scene, coding in Python3. In particular, a cable driver soft actuator will be modelled, explaining step by step how the Python scene is composed.

Furthermore the scene will be animated simulating the cable actuation of the soft robot, actuating with ramp signals and periodic ones, retrieving for example the end effector position, the cable length etc... saving the results .

At the end, another cubic object will be inserted in the simulation scene and the collision forces, between the robot and the cube will be showed.





P.S. The workshop is open for students from robotics and material science background, no need of particular skills in programming, the scene will be showed and explained step by step.

README (to do before to join in the workshop).

SOFA installation:

- Download Sofa from this website: <https://www.sofa-framework.org/download/>

Advice : Download the binaries version of SOFA. Download all the dependencies.

FOR USING PYTHON WITH THE BYNARY CODE VERSION :

- Download Python **version 3.7**: <https://www.python.org/downloads/windows/>

- (for Windows) Download a Python dev :

<https://www.anaconda.com/products/individual> (install everything)

ONLY IF YOU DOWNLOAD THE SOURCE CODE VERSION:

- Download the stable version : <https://www.sofa-framework.org/download/>

- Follow the installation (building) instruction (depending on your OS)

- Download the SofaPython3 plugin : <https://github.com/sofa-framework/SofaPython3>

- Download the STLIB plugin : <https://github.com/SofaDefrost/STLIB>

- Download the SoftRobots plugin: <https://github.com/SofaDefrost/SoftRobots>

P.S. The source code have the advantage to work also foe Python 3.8 version that in UBUNTU and MacOS are installed by default. If you use windows you can download it at same link above, selecting the right version.

