

Admission to the subsequent year **35th CYCLE 1st YEAR**

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Mentor: **Prof. Stefano MAURO**

Fellowship: Ateneo

Theme: **Soft Robotics**



State of the art



The problem

Developing a **robotic system** for environments that needs **limited mass and overall dimensions**, but **large operational workspace**, possibly, without high payload, velocity and accuracy as requirements.

Example: space and airborne applications



The idea

A robot with inflatable arms

Pros:

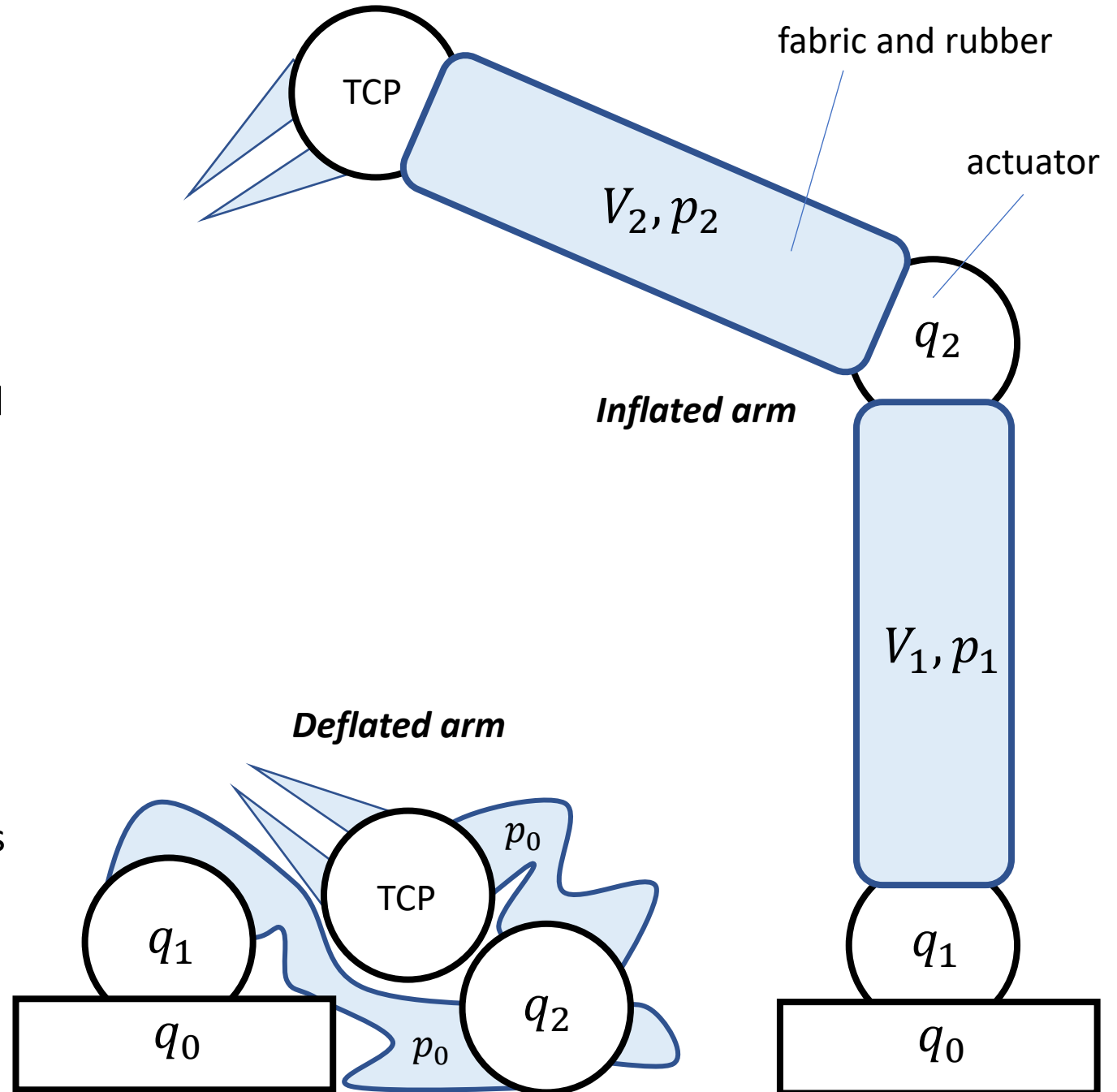
- Limited dimensions when deflated
- Lightness

Cons:

- Control

Possible applications

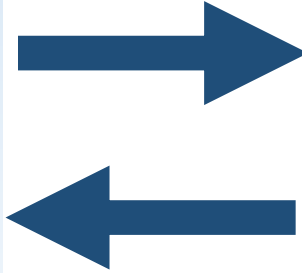
- Space
- Human-Robot Interaction
- Environments with difficult access
- Drone-mounted, airborne



The Foreseen Approach

Modeling and Numerical Analysis

- Optimization of the parameters
- System Simulations (Matlab/Simscape)
- FEM Analysis for soft bodies
- Control Design

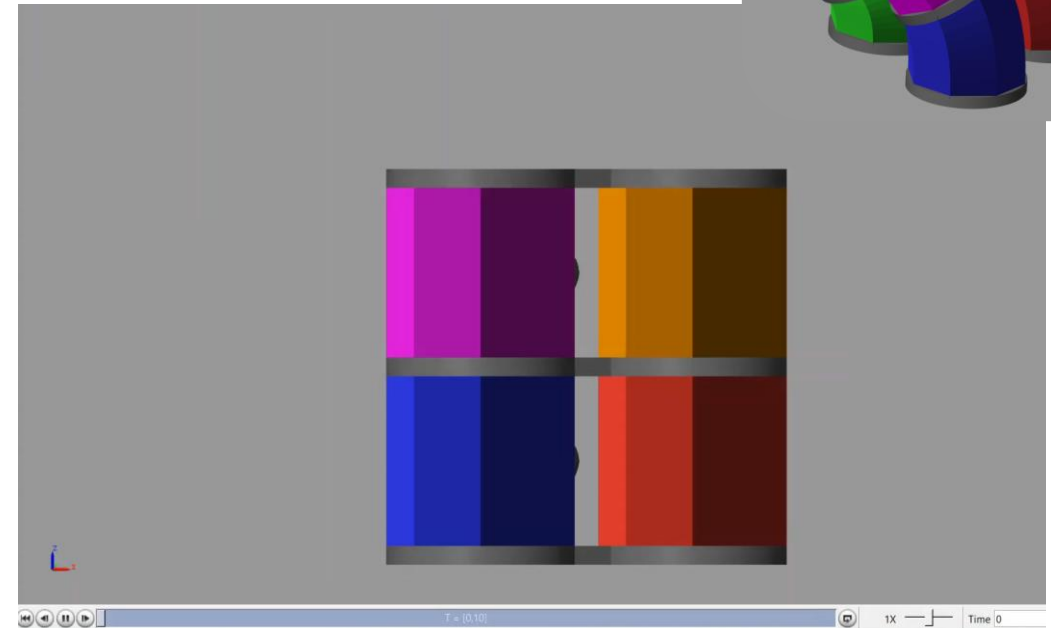
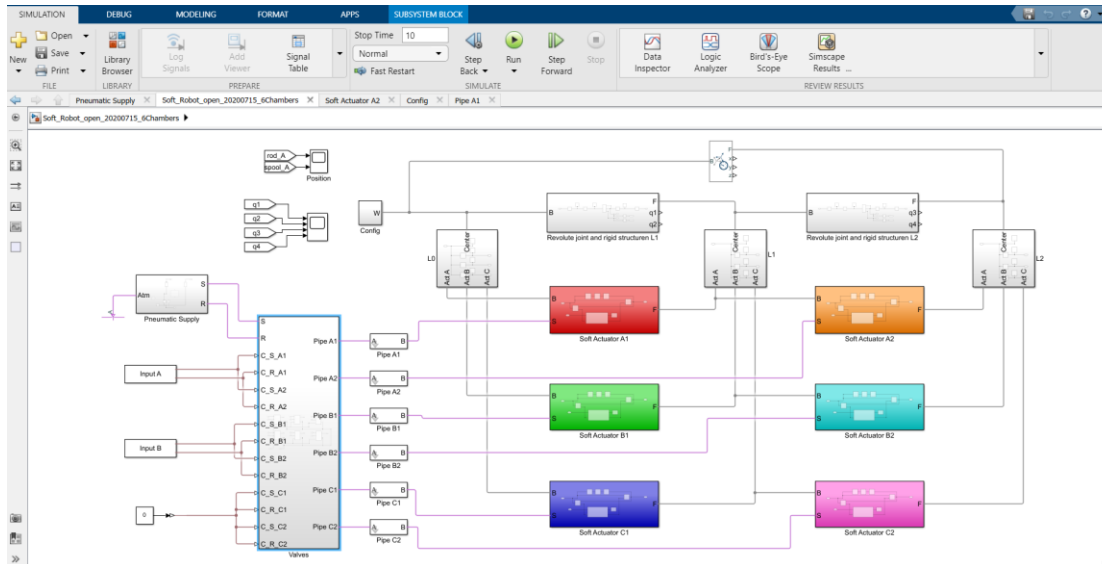


Prototyping and Experiments

- Geometry and materials
- Components
(Plant, Actuators, Sensors, Controller)
- Characterization

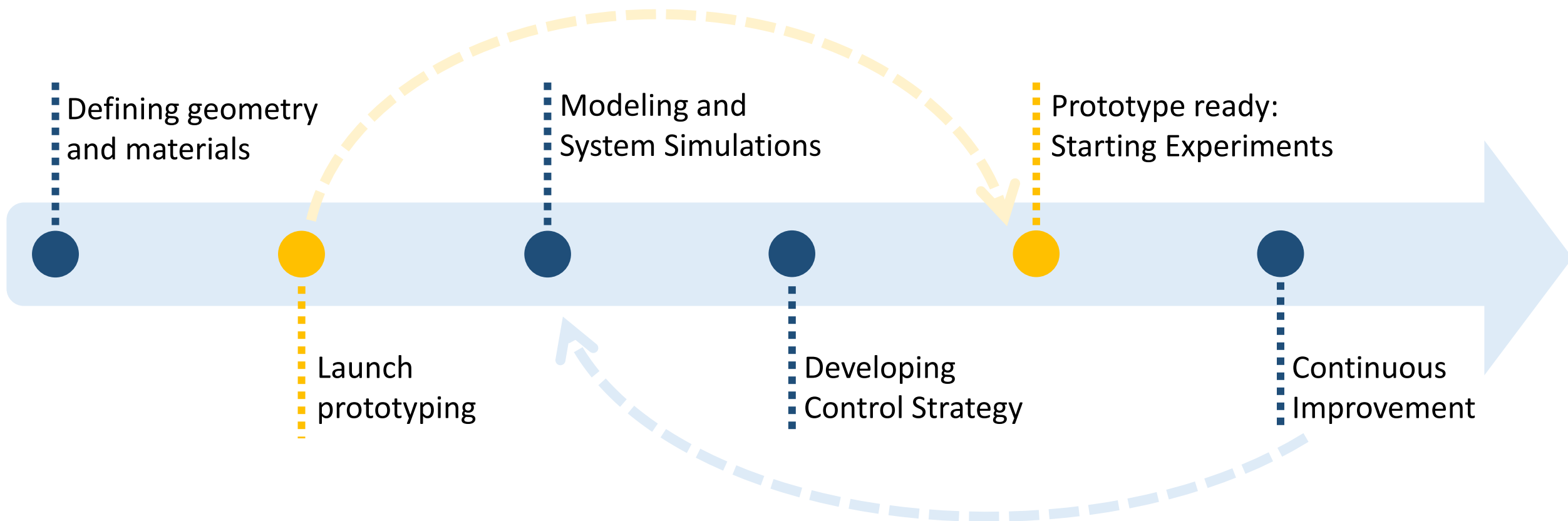
Early Results

- **Simscape model built for a pneumatic soft actuator**
 - Fast analysis of simplified models and management of the entire system
 - Limited capability in soft body simulation using standard blocks



- **Estimation of the possible configuration for inflatable links based on a first analytical study**
 - Length = 2,0 m
 - Diameter = 0,3 m
 - Pressure = 1 ÷ 5 bar
 - Payload = 15 kg

Work Plan



Thank you

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