

Student:	Name:	
	Student ID:	Departement:
	University:	
Thesis:	Title:	
	Kind of Thesis:	Semester:
Supervisor:	Prof. Dr. Mirko Kovac	
Advisor:	Mr Alex Dunnett	
Co-Advisor:	Dr Kevin Holdcroft	

Start of the Project:	Flexible
Deadline delivery final report:	6 months after start date (?)

Introduction

Traditional methods of ecologically surveying forest environments have been limited by the difficulty of physically sampling fragile specimens within the canopy. Aerial robotics are a promising solution. However, existing systems using aerial manipulators are often invasive due to the use of rigid components and lack of impedance control, or else such systems suffer from limited mission duration due to the weight and energy demands of the manipulator. This project will explore how a new paradigm of fast and compliant aerial manipulators could be used to sample fragile specimens using aerial platforms. Specifically, this project will take bio-inspiration from the radially-thinning hydrostat musculature employed by cephalopods to achieve some of the fastest grasping actions in the natural world.

This work sits at an intersection between bio-inspired design, aerial robotics and soft-robotics, aiming to develop an aerial manipulator that can retrieve fragile ecological samples from an arboreal environment.

Objectives

The objective of this work is to breakdown the action of a cephalopod's tentacular strike and then design, manufacture and characterise a bio-inspired aerial manipulator that operates in an analogous manner to that of the cephalopod. In a

best-case scenario, the resultant actuator could be integrated onto an aerial system and used as the basis for controller and trajectory planning work in the future.

Work breakdown

Work Package 1: Research cephalopod tentacle strikes and develop a representative model of the mechanics of the appendage during both the extension and grasp.

Work Package 2: Explore various physical and mechanical phenomena that could be feasibly exploited in an aerial manipulator.

Work Package 3: Design, prototype and characterise a cephalopod-inspired aerial manipulator, comparing performance to existing baselines.

The work location will be the Laboratory of Sustainability Robotics at EPFL (Lausanne) and will be conducted in collaboration with Empa (Dübendorf, Zurich). The formal supervision will be performed by Prof. Mirko Kovac. The project starting day would be discussed with Mr Alex Dunnett.

Requirements

The student belongs to EPFL ENAC or STI.

The student is motivated to work on an interdisciplinary research topic encompassing material/electrical/environmental/mechanical science & engineering.

Bibliography

Lausanne, 02/02/2026

Supervisor:

Prof. Mirko Kovac,
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Advisor:

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