

Semester project: Visualising honeybee collective behaviour

Semester project (8-10 ECTS), Fall semester 2024

Contact

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More info:

<https://www.epfl.ch/labs/mobots/education/student-projects/>

1 Context

The MOBOTS laboratory is specialised in animal-robot interactions and has experience with a wide range of species, including the western honeybee *apis mellifera* for the past few years. Through the development of **robotic platforms** that interact with honeybee colonies in various ways, access to intimate **honeybee collective behaviours** is unlocked.

Beyond the engineering and research, we also want to share knowledge about honeybees and robotics with a wider public, often hard to reach because of the technical aspect of robot-honeybee research. To overcome this, a **visual and artistic approach** is envisioned to captivate people and bridge highly-specialised research to the general public.

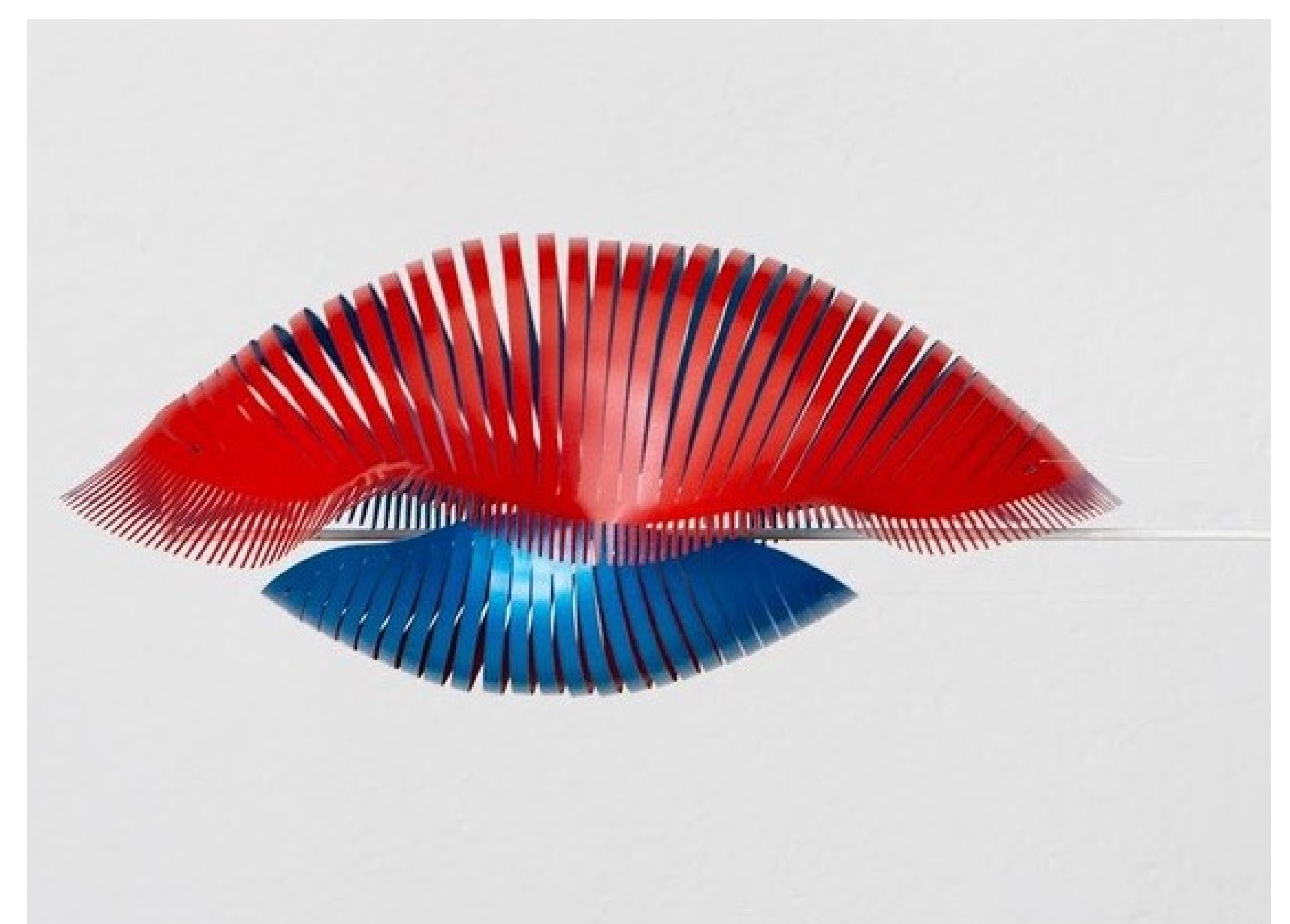


2 Objective

This semester project aims to develop a stand-alone visual representation that links with the honeybee collective behaviour of **winter clustering** (top figure). In the latter, honeybees group tightly together to limit heat losses from the colony, and the cluster radius varies based on ambient temperature, grouping tighter as temperatures drop. The aim of the installation will be to visually show the impact of **natural circadian rhythms** on winter cluster radii through a change in ambient temperatures. By the end of the project, the developed visualisation should be ready to be shared to a larger audience through an exhibition or an arts and science workshop.

3 Methodology

To accomplish the visualisation of honeybee winter clustering, the use of auxetic structures is suggested. In the latter, a stress applied in one direction will lead to strain in another direction, often with relevant amplitudes too (bottom figure). Stressing of the auxetic structure would be carried out using ad-hoc actuators (motors, linear actuators, etc.) driven by a corresponding mechanical housing and controlled in a way to optimise the visual accomplishment of the whole. Characterisation of real visual data will also be carried out to shape the installation's control.



4 Expected skills

Interest in the development of a visual representation with a creative approach is the main requirement. A creative problem-solving approach is highly beneficial.