

# DATASET SUPPORTING ‘HIGHLY AGILE FLAT SWIMMING ROBOT’

Florian Hartmann<sup>1,2,\*</sup>, Mrudhula Baskaran<sup>3</sup>, Gaetan Raynaud<sup>3</sup>, Mehdi Benbedda<sup>1</sup>, Karen Mulleners<sup>3</sup>, and Herbert Shea<sup>1,\*</sup>

<sup>1</sup>Soft Transducers Laboratory (LMTS), École Polytechnique Fédérale de Lausanne, Neuchâtel, Switzerland.

<sup>2</sup>Biomimetic Materials and Machines Group, Max Planck Institute for Intelligent Systems, Stuttgart, Germany.  
(present address)

<sup>3</sup>Unsteady Flow Diagnostics Laboratory, Institute of Mechanical Engineering, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

*\*Correspondence to: [hartmann@is.mpg.de](mailto:hartmann@is.mpg.de), [herbert.shea@epfl.ch](mailto:herbert.shea@epfl.ch)*

---

This data set contains the data supporting the work: ‘Highly agile flat swimming robot.’

The data set consists of the following folders:

1. **Characterization of tethered Locomotion Module**
2. **Characterization of Untethered Robot**
3. **Design files**

Below is a detailed description of the naming conventions, data types and the contents of each folder.

---

## NAMING CONVENTIONS

For measurement data, the filenames include information on the driving conditions with frequency values typically representing actuation frequencies and voltage values denoting the driving voltages applied during experiments.

Design files, include the number of actuators and size of the respective locomotion module in their filename.

---

## DATA TYPES

There are 5 file types in this data set:

- **Text Files (.txt)**  
Typically contain tap-separated measurement data such as speed, thrust, or motion capture measurements.
- **Data Files (.dat)**  
These files contain tap-separated measurement data such as speed, thrust, or motion capture measurements.
- **Images (.jpg, .png)**  
Visual data showing movement snapshots at different time points.
- **Videos (.mp4)**  
Contains video recordings of locomotion module movements during various tests and has motion tracking embedded in the video.
- **Spreadsheets (.xlsx)**  
Calibration of experimental setup data.
- **Vector-graphics (.pdf)**  
Vector graphics design files used for the fabrication of locomotion modules. The files include several layers. Files can be opened with software such as Adobe Illustrator.

---

## CHARACTERIZATION OF TETHERED LOCOMOTION MODULE

Contains data related to the tethered locomotion modules and to the modeling.

### 2-actuator-design

Characterization data related to the 2-actuator design of the locomotion module.

#### FREE-SWIMMING-TESTS

Contains data from tethered free swimming tests.

- Fig-2-C
- Fig-4-D-E

#### THRUST-MEASUREMENTS

Contains data on thrust measurements.

- Fig-2-E-G
- Fig-S14

#### SCALING ANALYSIS

Contains data on locomotion modules with scaled size or fin span.

- Fig-3-B
- Fig-3-D

#### PIV

Contains data on the analysis of the surface flow.

- Fig-S12-D-E

#### MODELING

Contains data and models related to the modeling part of the work.

- Fig-S9-B, Fig-S9-C

#### UNDERWATER TESTS

Contains data on the underwater tests performed.

- Fig-S1-A-B

### 4-actuator-design

Characterization data related to the 4-actuator design of the locomotion module.

- Fig-S14

### Single-Actuator-Harmonics

Characterization data and design files for a single actuator, used to determine the material parameters for the analytic models.

- Fig-S9-A

---

## CHARACTERIZATION OF UNTETHERED ROBOT

Contains data related to the untethered robot and its power supply.

### HVPS-characterization

Contains data related to the characterization of the high voltage power supply that is used in the untethered robot.

- Fig-5-C
- Fig-5-D
- FigS15-D-F

### Swimming-Speed

Contains data related to the characterization of the translational and rotational swimming speed of the untethered robot.

- Fig-S17-A-B

---

## DESIGN FILES

This folder contains 2D design files of all locomotion modules in this work. Each file contains multiple layers. The files are provided as used in the fabrication process.