

# Dynamic parameter identification of a modular robot manipulator arm



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## Background

Knowing the model of a robot serves multiple purposes: an accurate robot model enables high-precision and stable control much needed in manufacturing, allows us to accurately simulate the robot behavior, and is crucial for verification tasks. Such highly valuable information is protected by robot manufacturers and is never shared to their customers. However, through various techniques (also known as model identification) it is possible to experimentally obtain an accurate estimation of the robot model.

## Description

Model identification is a topic which has been discussed for decades until today. Which experiments should one carry out? Which optimization techniques should we use for estimation? How much data do we need? Out of the many techniques, that have been developed over the years, we want to understand which method serves which purpose and ultimately we choose the best one for our robot.

The study subject is a Schunk LWA-4P robot (see picture), which is a light-weight manipulator arm. Its most interesting property is that has been constructed as a modular robot, which means that it can be disassembled and reassembled (in a new configuration) very quickly. It is your task to find an identification scheme, that takes advantage of these properties and can be reused to reidentify the robot in different configurations.



## Tasks

- Literature research on available identification methods for robot arms
- Decide on suitable methods for our robot arm
- Plan, implement and carry out identification experiments on a Schunk LWA-4P arm
- Evaluation of the performance of the robot and of the identification scheme.

## References

- [1] Christopher G Atkeson, Chae H An, and John M Hollerbach. Estimation of inertial parameters of manipulator loads and links. *The International Journal of Robotics Research*, 5(3):101–119, 1986.
- [2] Stefan Bethge, Jörn Malzahn, Nikolaos Tsagarakis, and Darwin Caldwell. Flobaroid—a software package for the identification of robot dynamics parameters. In *International Conference on Robotics in Alpe-Adria Danube Region*, pages 156–165. Springer, 2017.

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**Research project:**

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**Type:**

BA/MA

**Research area:**

Robot modelling, optimization, experimental

**Programming language:**

MATLAB

**Required skills:**

Knowledge in dynamical systems, good mathematical background

**Language:**

English, German

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