

# Solving Real-world Robotics Tasks within 3D Scans



Technische Universität München

## Background

Robots have yet to make an entrance into many industries (outside mass-manufacturing) and the service sector. A major hurdle to their widespread adoption is the complexity of their deployment, requiring costly specialists for every new task one wants to automate. We envision simple tools which help to choose the right robot and its deployment given a task and environment specification.



Fakultät für Informatik

Lehrstuhl für Echtzeitsysteme und Robotik

## Description

Within this broader goal you will help us create and evaluate new robotic benchmark tasks. This entails finding and digitizing robotic tasks found in the real world, storing them within our benchmark suite CoBRA<sup>1</sup> and proposing solutions with our optimization framework timor<sup>2</sup>.

We envision a pipeline starting with a consumer 3D scanner, such as newer iPads / iPhones, to scan real world scenes. A user-friendly editor should then be helping to define the tasks to do in the scanned 3D scene. Lastly timor could be used to propose (modular) robots to solve the defined tasks. Real-world tests with the prototype application should be done in industrial settings such as university workshops or with industrial partners. Stretch goals could include a user study where novice users try to define realworld tasks with the pipeline, tighter integration with timor, or deploying a programmed task on the real robot in our lab.



A modular robot solving a CoBRA benchmark in a 3D scanned office.

---

### Supervisor:

Prof. Dr.-Ing. Matthias Althoff

### Advisor:

Matthias Mayer

### Research project:

CONCERT

### Type:

MA/BA

### Research area:

Robotics, 3D Perception, UI

### Programming language:

Python

### Required skills:

Linux

### Language:

English and German

### Date of submission:

20. Oktober 2022

---

### For more information please contact us:

Phone: +49.89.289.18114

E-Mail: [matthias.mayer@tum.de](mailto:matthias.mayer@tum.de)

Internet: [www6.in.tum.de](http://www6.in.tum.de)

---

<sup>1</sup>Composable Robotics Benchmark: [cobra.cps.cit.tum.de](http://cobra.cps.cit.tum.de)

<sup>2</sup><https://pypi.org/project/timor-python/>

## Tasks

- Literature review on robotics benchmarks
- Design and create pipeline to digitize robotic tasks
- Use 3D scanning equipment (iPhone / iPad with LiDAR) to scan real-world applications in workshops on campus and in industry
- Discuss typical factory tasks with local workers and implement them as benchmarks

## References

- [1] Jonathan Külz, Matthias Mayer, and Matthias Althoff. Toolbox for Industrial Modular Robotics: Timor Python. arXiv:2209.06758 [cs.RO], 2022.
- [2] Matthias Mayer, Jonathan Külz, and Matthias Althoff. CoBRA: A Composable Benchmark for Robotics Applications. arXiv:2203.09337 [cs.RO], 2022.



Technische Universität München



Fakultät für Informatik

Lehrstuhl für Echtzeitsysteme und Robotik