Munich, November 24th 2023

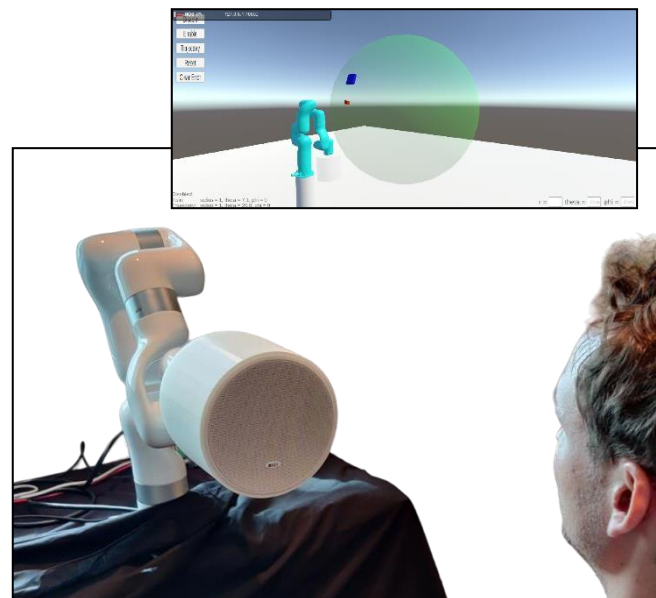# Master's Thesis: Setup for Robotic Sound Field Audiometry

The *Experimental Audiology Lab* (*exalab*) is looking for a motivated individual for a master's thesis in the field of *Mechatronics*, *Robotics* or a related study program to work on the development of an innovative robotic system for clinical hearing tests.

Background and aim

Modern hearing aids and implant audio processors use powerful algorithms to react to environmental sound conditions (e.g. moving noise sources). However, available hearing test setups in clinics have hardly evolved since decades and only enable measurements under static conditions, i.e., with a few loudspeakers at fixed positions. Therefore, more realistic and reproducible acoustic tests that help to find the optimal treatment for patients with hearing loss are required.

The aim of this thesis is to design and implement a robotic test setup that enables dynamic and precise hearing tests in various sound environments. This system will provide entirely new diagnostic tests and can help patients in their rehabilitation of sound localization.

Fig. 1: Prototype setup for robotic sound field audiometry, consisting of a serial arm (xArm6) with loudspeaker and the control software (Unity + ROS).

Tasks and nature of the thesis

- Test setup implementation based on an existing prototype (6dof robotic arm *xArm6*, see **Fig. 1**)
- Design and testing of a control software for hearing tests (e.g., speech understanding in noise)
- Extension of the system by additional 4 static loudspeakers (total of 5 audio channels)
- Documentation and thesis writing

Requirements

- Experience with robotic systems and control
- Strong programming skills (Python or C#)
- Knowledge of ROS/ROS2 and Unity engine is advantageous

Our offer

- Opportunity to engage in highly innovative clinical research as part of a young interdisciplinary team
- Supervision on site for the whole duration of the master's thesis
- Potential for publication and contact to industrial partners

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