



**AUDI**  
KONFUZIUS-INSTITUT  
INGOLSTADT

**AKII Microlab**



Technische Hochschule  
Ingolstadt

## Bachelor/Master Thesis

# Sensor Fusion for Improved VR Avatar Pose Estimation

### Problem description

The proposed project proposes the development of a sensor fusion method for VIRTOOAIR: Virtual Reality Toolbox for Avatar Intelligent Reconstruction. VIRTOOAIR focuses on designing and developing a Deep Learning framework for improved avatar representations in immersive collaborative virtual environments. The specific sensor fusion problem proposes improved position estimation from single RGB frames acquired from a camera (i.e. estimated through a deep learning network) and VR controllers. The VR controllers are the main components for the VR systems. They interact with the system's processing unit which computes the orientation of the user's view point, from hand and head devices. Yet, it is not straightforward to calculate the position of the user using the information from the controllers. We developed an inverse kinematics solver which can convert the data from the controllers into motion angles using a neural network. Similarly, using a deep neural network we can also extract position information from the incoming RGB frames from the camera. This project aims at exploring algorithms for fusing RGB estimated pose and the inverse kinematics estimated pose from the VR controllers.

### Tasks

- Get familiar with VIRTOOAIR deep learning end-to-end reconstruction framework and existing code base.
- Investigate the design and usage of the existing VIRTOOAIR neural networks inverse kinematics solver using controllers' data.
- Get familiar with typical sensor fusion algorithms (e.g. Kalman Filter, Complementary Filters, and Bayesian Inference).
- Design and implement the selected algorithms and apply them in real-time in the end-to-end reconstruction framework.
- Design experiment for testing and evaluating the implementations (i.e. latency, accuracy).

### Required skills

Strong programming experience (Python), good mathematical skills, machine vision experience.

### Preferred field of study

BA/MA Computer Science, BA/MA Mechatronics (Robotics)

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