Andreas Halbig — Portfolio

andreas_halbig@yahoo.de +4915143146870
LinkedIn https://hci.uni-wuerzburg.de/people/andreas-halbig/

Educational Browser Game (Full-Stack Development)

Type: Bachelor Project
Link: YouTube Demo
Description: In this project, together with a project group, I developed a serious game for the web browser. In this game, users can solve various mental arithmetic tasks. There are different modes (e.g., against the clock or word problems), and the difficulty level can also be adjusted. Users have their own accounts with customizable avatars, leaderboards and high scores are tracked, friends can be added, and users can chat with each other. Additionally, QR codes can be scanned to unlock new tasks. An authoring interface was also developed, allowing new tasks to be added easily (this was not web-based but implemented with JavaFX). I was personally involved in all areas of the development of this application (web server, game logic, databases, authoring interface, player interface).
Skills/Techniques: Java, JavaScript, HTML, CSS, Play Framework, JavaFX, SQL

Maintaining the Chair's Website

Type: Work Project
Link: Interactive Online Questionnaire
Description: As part of my work as a research assistant, I was also a member of the chair's PR team with responsibility for maintaining and extending the group's website. My tasks included updating content (e.g., news posts, new staff profiles) and developing new features such as an interactive questionnaire with automated evaluation (see link above). In addition, I led the PR team's weekly meetings, coordinating tasks and setting priorities.
Skills/Techniques: Jekyll, JavaScript, React, Team Coordination

Modular System for VR & Sensor Data

Type: Research Project
Description: I developed the Measurement Engine, a modular and extensible framework for collecting, processing, and visualizing physiological and behavioral data. The system integrates input from physiological sensors as well as VR engines (e.g., eye-tracking, gyroscope, event data), treating the XR engine itself as a special type of sensor. A Python-based backend manages sensor representation, data streams, and processing modules, while a web-based GUI (React) provides real-time visualization and configuration. Unlike typical in-VR feedback systems, the Measurement Engine is designed for external observers (e.g., therapists, supervisors), supporting live monitoring of user states and longitudinal analysis across sessions. It is extensible through custom data-processing algorithms, live-processing modules, and additional sensors. To simplify deployment, the Measurement Engine was packaged as a Node.js module, enabling one-command installation.
Link: Additional Diagram and Images
Skills/Techniques: Python, Flask, Unity, C#, React, Typescript, Physiological Computing, NodeJS, HTML, CSS

Enhancing a Web Platform for Person-Centered Elderly Care

Type: Bachelor Thesis
Description: In my Bachelor Thesis, I improved CareShare, a web application that supports person-centered care in nursing homes by facilitating communication between caregivers and residents' relatives. I designed and implemented multiple new features, including a personal timeline, a personalized music playlist, and background information about residents' formative years. This involved full-stack development across both front-end and back-end components. To assess the usefulness of these features, I conducted semi-structured interviews with experts in elderly care, which confirmed the practical value of the implemented concepts.
Link: Additional Images
Skills/Techniques: JavaScript, React, MeteorJS, MongoDB, Full-Stack Web Development, User-Centered Design, Evaluation & User Research

Custom Neural Network for Gesture Recognition

Type: Master Project
Link: YouTube Demo
Description: In this group project, we built a machine learning algorithm for gesture recognition. For this, we did not use any of the common libraries or frameworks but instead programmed everything from scratch. This included the representation of the input data and the artificial neural network, the matrix and vector multiplications, as well as the backpropagation algorithm, which is responsible for enabling the network to actually learn from the data. As input data, we used recordings from a depth camera, based on which the system could distinguish different gestures. We also collected and preprocessed this data ourselves..
Skills/Techniques: Scala, MATLAB, Neural Networks, Machine Learning, Data Preprocessing

VR Selection Techniques

Type: Master Project
Link: YouTube Demo
Description: In this project, I collaborated with a partner to develop and evaluate different selection techniques for Virtual Reality. Among them was a novel method we conceived, the Invisibility Ray, which allows users to temporarily hide foreground objects in order to select items behind them. Additionally, we designed an experimental setup to systematically compare the different selection techniques.
Skills/Techniques: Unity, C#, User Testing, Experimental Design, Virtual Reality

Virtual Crowd Simulation for Learning Environments

Type: Master Thesis
Link: YouTube Demo
Description: In my Master Thesis, I designed and implemented a simulation of virtual agents in Virtual Reality (VR) learning environments. The system recreated the atmosphere of a studying community through the presence and behavior of a virtual crowd. Technically, I developed a finite-state machine framework for agent-based behavior modeling. Agents were organized into dynamic group structures (classical, intermediate, individual) that determined collaborative or individual study patterns. They could perform diverse activities (reading, writing, laptop work) or disengage (relaxing, not paying attention). Their actions were further influenced by emotional states (neutral, enthusiastic, desperate) to add variation and realism. Agents could also react subtly to the user through nonverbal cues such as gaze interaction, nodding, or hand-raising.
Skills/Techniques: Unreal Engine 4, Virtual Reality, Agent-Based Simulation, Finite-State Machines, Behavioral Modeling, Experimental Design, User Testing

Multimodal Interaction

Type: Master Project
Link: YouTube Demo
Description: In this project, I collaborated with a partner to design a multimodal interaction technique for virtual environments that combines natural language input with pointing gestures. This allows users to select and manipulate virtual objects by speaking and gesturing simultaneously. Based on this technique, we developed an interactive room designer where users can spawn furniture, move it around, and modify its color and size.
Skills/Techniques: Unity, C#, Virtual Reality

Simulation of Human–AI Interaction in VR

Type: Research Project
Link: YouTube Demo
Description: In this research project, I explored human–AI interaction by giving an AI a virtual body, gestures, and facial expressions in VR. The study focused on human–AI teaming, investigating what happens when humans and AI collaborate as equals. I developed a VR prototype to test whether a stressed emotional state displayed by the AI could influence the emotional state of participants. The study also examined how this effect varied depending on the embodiment of both the AI (abstract vs. human-like) and the participants (abstract vs. human-like avatars).
Skills/Techniques: Unity, C#, Virtual Reality, Motion Capture, Experimental Design, User Testing

Development of a VR Classroom Training System

Type: Bachelor Project
Link: YouTube Demo
Description: In this group project, we developed a VR classroom simulation for teacher training. Users take the role of a teacher standing in front of a class of virtual students. A second person can use an instructor interface to control the students' behavior, enabling teachers to repeatedly practice how to handle critical classroom situations. The project was conducted in collaboration with the Department of Educational Pedagogy. My personal contributions included coordinating the project, designing the virtual classroom environment, and developing parts of the instructor interface.
Skills/Techniques: Unreal Engine, Virtual Reality, User-Centered Design

Research Publications

1. A. Halbig and M. E. Latoschik, "The interwoven nature of spatial presence and virtual embodiment: A comprehensive perspective," *Frontiers in Virtual Reality*, vol. 6, 2025. DOI: 10.3389/frvir.2025.1616662.
2. A. Halbig and M. E. Latoschik, "Common cues? toward the relationship of spatial presence and the sense of embodiment," in *23rd IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Los Alamitos, CA, USA: IEEE Computer Society, 2024, pp. 1117–1126. DOI: 10.1109/ISMAR62088.2024.00128.
3. M. Yalcin, A. Halbig, M. Fischbach, and M. E. Latoschik, "Automatic cybersickness detection by deep learning of augmented physiological data from off-the-shelf consumer-grade sensors," *Frontiers in Virtual Reality*, vol. 5, 2024. DOI: 10.3389/frvir.2024.1364207.
4. A. Halbig, S. K. Babu, S. Gatter, M. E. Latoschik, K. Brukamp, and S. von Mammen, "Opportunities and challenges of virtual reality in healthcare – a domain experts inquiry," *Frontiers in Virtual Reality*, vol. 3, 2022. DOI: 10.3389/frvir.2022.837616.
5. A. Halbig and M. E. Latoschik, "A systematic review of physiological measurements, factors, methods, and applications in virtual reality," *Frontiers in Virtual Reality*, vol. 2, p. 89, 2021. DOI: 10.3389/frvir.2021.694567.