Design

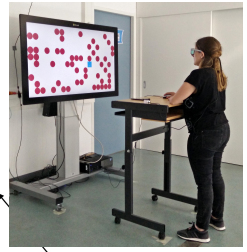
Evaluation

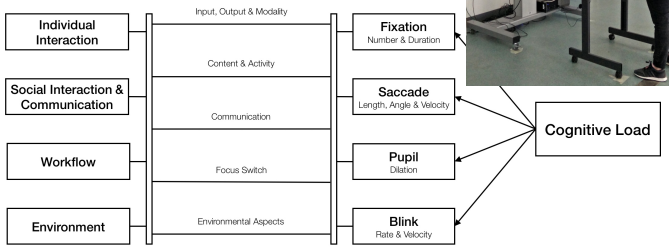
Bachelor / Master

MODE: Task Load and Adaptive Interfaces

Scenario

In addition to classical measurements of usability (effectiveness, efficiency, satisfaction), researchers are constantly investigating additional metrics to assess the quality of system support for human task performance. One of them is **cognitive load**: the amount of mental effort that is used from the working memory while performing a cognitive task and interacting with a system. Cognitive load can be measured using **eye tracking** technology, which allows to detect users' current load and e.g. adapt interfaces in real time to adapt to the situation and task at hand.





Project Goal

The outcome of this project is a sound state-of-the-art analysis on the topics of cognitive load and eye tracking and the development of an adaptive prototype, that detects the current load of users and adapts accordingly. This prototype allows for further evaluation and the validation of a theoretical model.

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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Design

Evaluation

Bachelor / Master

EVA: Framework & Toolbox for Evaluating Interaction

Scenario

Designing, conducting, and analysing experiments is effortful: Experimenters not only need to find appropriate **models, metrics, and tasks** but also have to conduct studies in suitable settings. These two aspects are the basis for the analysis of the outcome of the experiment. Yet, most of the named activities are seperated of each other, leading to even more effort. A framework that guides experimenters during their work and provides necessary documents & tools can tackle these issues and allows additionally for the comparison of experiments.

Project Goal

The outcome of this project is a combination of a state-of-the-art analysis of existing frameworks and toolboxes and a contextual inquiry of experimenters, their tasks, and settings while designing studies and analysing their outcome. This analysis poses requirements for a system to support experimenters in evaluating interaction, which allows for further in-the-field evaluation.

Task

Literature research, state-of-the-art analysis , and contextual inquiry (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

Contact

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Design

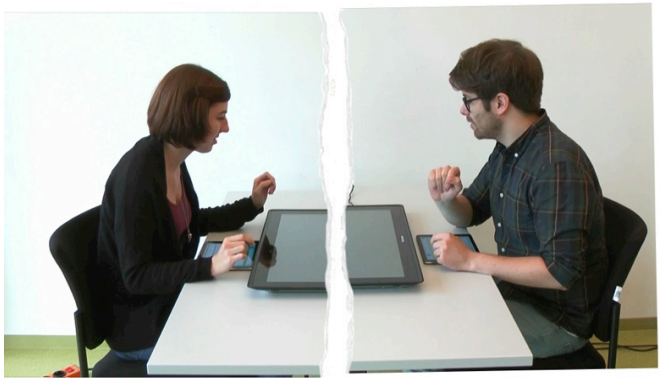
Evaluation

Bachelor / Master

AROUND THE WORLD: Remote Collaboration Techniques

Scenario

Collaboration is part of everyday business for a variety of scenarios: Creative designers combine their ideas as groups, students elaborate topics together and face-to-face communication facilitates successful group work. At the same time, more and more work is spread **around the globe**, which leads to video conferences, excessive mail correspondence and a lack of awareness about work partners' activities. However, today's technology allows for bridging this gap and enabling groups to individually and collaboratively engage in group work activities.



Project Goal

The outcome of this project is a sound state-of-the-art analysis of remote collaboration techniques, a setting that allows for remote collaboration in a specific scenario and a further development of existing prototypes enabling collaborative group activities. The implementation allows for further evaluation.

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

Contact

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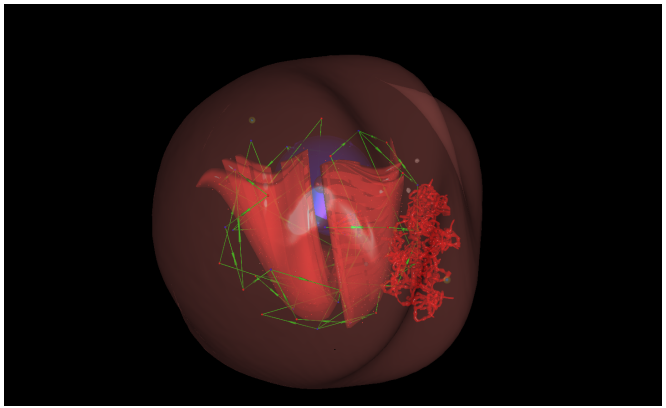
Evaluation

Bachelor / Master

DOI: Comparing Different Degrees of Immersion for Life Sciences

Scenario

Research in life sciences (e.g. biology, biochemistry and related areas) often deals with the analysis of components like e.g. cells, the exploration of biological processes, and the investigation of biological networks. Recent hardware developments in technologies provide consumer products (e.g. Microsoft HoloLens, HTC Vive, etc.) that allow to deal with this multidimensional data in 3D space. Yet the question remains, how different levels of immersion (e.g. from augmented to virtual reality) can be used to support life scientists in their everyday business.



Project Goal

The outcome of this project is a comparative study of different 3D output devices in the context of life sciences. This project is in collaboration with the Computational Life Sciences Group (cls.uni.kn)

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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Evaluation

Bachelor / Master

Object Manipulation in 3D Spaces: Comparison of Input Devices

Scenario

Interaction in virtual 3D Spaces is an important topic due to the new era of virtual reality and augmented reality devices. Input modalities and devices range from classical game controllers to new 3D controllers up to bare hands (e.g. leap motion). A whole body of research has looked on the performance of different input modalities for 2D spaces (e.g. Fitt's Law studies). However for 3D spaces only a few studies exists. So it is still an unanswered question which interaction device performs best in specific tasks and environments.

Project Goal

The outcome of this project is a comparative study of different 3D input devices. This study should at least answer the following questions:

- Which device has the highest navigation performance (Fitt's law)
- How high is the physical demand of the different devices

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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Design

Evaluation

Bachelor / Master

Chair I/O 2.0

Scenario

Chairs are items of our daily lives. Different kinds of chairs exists to support heterogeneous activities and scenarios e.g. office chairs, leisure chairs, and medical chairs. The resurrection of virtual reality adds a new task for chairs: support navigation and gaming in virtual worlds. This topic was first examined by a project called “ChairIO” in the year 2005. In the original ChairIO project a chair-based computer interface was developed. During the last year some kickstarter campaign picked up the topic and present new hardware solutions: RotoVR, Turris Chair, and VRGO Chair (see picture). The upcoming products rely on the development of new hardware.

Project Goal

The goal of the project is not to develop a new hardware solution but use existing smartphone sensors to augment a physical chair. The outcome of this project is a smartphone app which allows by attaching the phone to chair a navigation in virtual spaces. Furthermore a evaluation of this input device would be desirable.

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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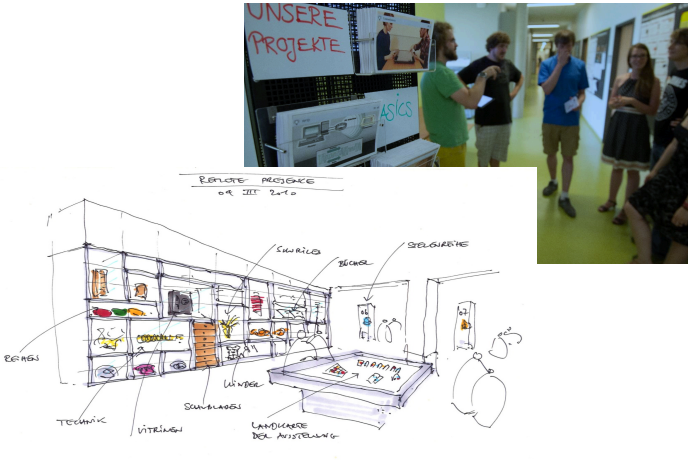
Design

Evaluation

Bachelor / Master

Exhibition Design: Hybrid Toolbox for Ideation Workshops



Scenario

Collaborative creative sessions and workshops are commonplace in design and are often central to driving ideation and concept development. Physical tools and materials often play a major part in these sessions, for instance in the shape of pen, paper, sticky-notes, and whiteboards that participants use to explore and express ideas, and to discuss and iterate on concepts. Digital tools, on the other hand, often play a more marginal role in such collaborative events. This holds true even in cases where the intended end-product is digital, e.g. when interaction designers develop concepts for new prototypes.

Project Goal

Physical tools have a number of benefits that make them well-suited for these activities, and that developing digital tools that support or augment collaborative creative processes is a highly complex challenge. In this project you will create digital tools that will help exhibition designers during their creative processes.

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Development of software (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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Evaluation

Bachelor / Master

AR vs. VR display collaboration

Scenario

Augmented Reality (AR) displays can create the illusion of virtual objects being situated in the user's physical environment (see images right). They are often referred to as the "next generation collaborative interfaces." For some tasks, however, studies have shown that collaborators do not pay much attention to their physical environment when using AR displays. This raises the question whether the physical environment should be displayed at all.

Project Goal

Provide answers to the following question: *Does the display mode* influence collaboration**?*

**AR mode: physical environment is displayed; VR mode: only virtual objects are displayed*
***co-located vs. remote*

Task

Experimental research, consisting of the following steps:

- Literature research, formulation of hypotheses (seminar presentation & paper)
- Design of study and implementation of study prototype (project presentation & paper)
- Conduction of study & analysis (thesis & thesis defense)

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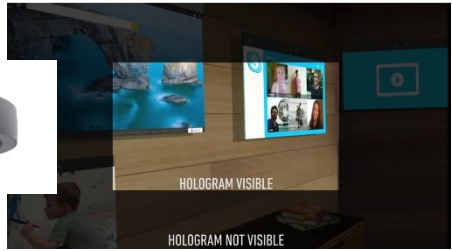
Evaluation

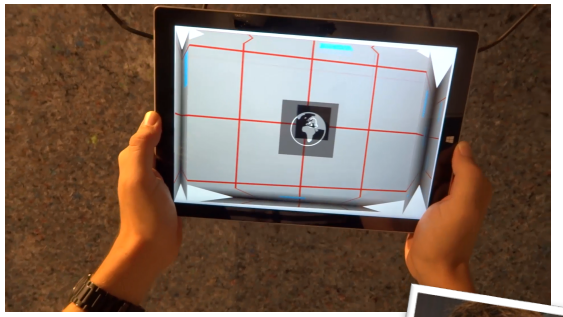
Bachelor / Master
Focus + Context Techniques for Mixed-Reality Devices



Scenario

Mixed-reality devices like the Microsoft HoloLens or the Google Project Tango provide the means to overlay our physical environment with digital content. However, to date these devices provide only a very limited field of view. They therefore only allow for a peephole navigation which cuts of contextual information.

For desktop systems there is a huge variety of approaches to overcome the display size limitation and provide contextual information to the user. These techniques are called Focus+Context techniques and range from FishEye views to folding techniques like SpaceFold.



Project Goal

Provide answers to the following question:

Are known Focus+Context techniques (especially folding techniques) suitable for mixed-reality devices?

Task

Literature research and state-of-the-art analysis (seminar thesis)

Design and discussion of several interaction and visualization concepts (project work)

Implementation of a Unity prototype for Microsoft Holo Lens and/or Tango tablet (project work)

Evaluation of the Focus+Context techniques in a lab setting (thesis)

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Design

Bachelor / Master

Visual Data Analysis on Mobile Devices

Scenario

Visual analytics partly made its way on mobile devices. Tools like Tableau mobile are specifically designed to be used on mobile touch enabled devices. One big drawback of data analysis on mobile devices is the limited screen real estate. However, display space is a crucial success factor when visual information has to be analyzed. Mixed-reality glasses can help to overcome this limitation as they provide the means to offload visual information into the environment and therefore extend the available space. The interplay between mobile devices to configure visualizations and mixed-reality glasses to view the resulting visualization represents a promising design space.

Project Goal

Investigate the design space of combining mobile devices like tablets with mixed-reality glasses in the context of visual analytics. Design and implement an application which consists of two modules: (1) a tablet module which allows for the configuration of visualizations (e.g. by using the Tableau API) and (2) a mixed-reality glass module which allows for the visualization of the information. The focus of the work should be placed on the interplay between these two modules.

Task

Literature research and state-of-the-art analysis (seminar thesis)

Design and discussion of interaction and visualization concepts (project work)

Implementation of a prototype for Microsoft HoloLens (Unity) and Apple iPad (project work)

Evaluation of the visualization and data analysis concept (thesis)

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Design

Evaluation

Bachelor / Master

SoundMotion: Motion guidance by spatial sound

Scenario

One way to guide human motion is to provide auditory feedback. In contrast to visual feedback, auditory feedback may reduce distraction and could help to minimize perceptual overload (Sigrist et al., 2012). In case a movement error was made, the learning of motion sequences can potentially benefit from the communication of positional information (which is the body part which was moved in the wrong way?) and information in regard to the deviation of the optimal body posture (how large is the deviation?). For example, auditory feedback could convey positional information through spatial sound and the deviation between optimal body posture and current posture through pitch.

Project Goal

Develop a prototype for a system which supports motion guidance by spatial sound. Support the communication of (1) positional information and (2) the deviation between optimal body posture and current body posture. Evaluate the created system.

Image: Google

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Concept design & implementation of concept (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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Design

Evaluation

Bachelor / Master

ALF: Adaptive Long-term Feedback

Scenario

Present technical systems which support the learning of motion sequence or the change of a motion behavior, frequently neglect a learners progress over time in regard to the feedback which is provided to him or her. To adapt the feedback in relation to different factors like learning time (how long did the person learn?) and learning success (how high was the learning success so far?) can help to eventually guide people to an automatic execution of a motion sequence, respectively a change in their behavior, in the long-term. The idea is that a learned skill or concept is transferred to a routine and thus the need to stop and think about what to do diminishes.

Example Scenario: Adapting feedback for *distance between feet* over learning time. The feedback is stepwise reduced until the concept is automatically applied by the learner.

Project Goal

Develop a system which supports adaptive long-term feedback. Consider different factors like learning time and learning success. Evaluate the implementation.

Task

Literature research, state-of-the-art analysis (seminar presentation & paper)

Concept design & implementation of concept(s) (project presentation & paper)

Conduction of study & analysis (thesis & thesis defence)

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