Topics for Student Projects and Bachelor / Diploma / Master Theses

General Topic: Remote 3D Interaction

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Gaze-supported Interaction in Virtual 3D Environments

- Natural interaction
- Virtual 3D environments
- Multimodal interaction
- Attentive displays
Goal:
- Suitable multimodal combination of gaze controls with additional input modalities, such as smartphones, multitouch tables, or freehand gestures (using the Kinect)
- Development of subtle ways to use gaze data to improve interaction processes
- User-elicited design evaluation

Features:
- Suitable interaction design
- Testing different multimodal approaches

Requirements:
- Good programming skills
- High interest in developing novel interaction techniques
S2: Remote Interaction with 3D Virtual Environments

- **Goal:**
  - 3D graphics on a mobile multitouch device for direct interaction with 3D objects → 3D widgets
  - Focus on *Selection & Manipulation*
  - Consideration of visual attention

- **Features:**
  - Suitable interface design
  - Interaction techniques (using 3D widgets, acceleration sensors, multitouch)
  - Application scenarios
    - Exploration of medical data
    - Gaze-supported detail-and-context techniques

- **Requirements:**
  - Very good programming skills (C#, Java or Objective C)
  - High interest in user interface design
S3: Remote PPUI with Improved Haptic Feedback

Goal:
- Design of digital pen-and-paper-based user interfaces (PPUIs) for remotely interacting with a virtual environment on a large display
- Integrating haptic feedback by considering different form factors (think outside the box!) and applying additional gadgets (e.g., rubber bands)

Features:
- Sophisticated interface design
- Testing different design alternatives
- Application areas: Navigation in 3D VEs

Requirements:
- Creativity 😊
- Interest in advanced user interface design
- (Good programming skills)
S4: Visual Gaze Analysis in Virtual Environments

- **Goal:**
  - Development of a toolkit for analyzing gaze data from virtual environments
  - **Gaze visualizations** to support the development of gaze-based interaction processes

- **Features:**
  - Consistent data structure for representing 3D gaze data
  - Loading and visualizing these data for 2D and 3D contexts
  - Collaboration with University of Bielefeld

- **Requirements:**
  - Very good programming skills (C++/C#)
  - Interest in computer graphics
Goal:
- Development of gaze-based local graphical user interfaces (context menus)
- Aiming for reduced need for dwell-time activation, instead apply other means such as gaze gestures or gaze-based flicking

Features:
- Critical discussion of design considerations for gaze-based context menus
- Application areas include system control tasks and exploration of hierarchical data

Requirements:
- Interest in advanced user interface design and information visualizations
- User study
- (Good programming skills)
S6: Gaze-based Semantic Zooming

- **Goal:**
  - Improve **overview and context** by 'decluttering' views
  - Semantic zooming based on the **user’s visual attention**

- **Features:**
  - Discussion of gaze-based semantic zooming techniques
    - Should information be displayed directly at the point-of-regard?
    - How could the visual attention be directed to other locations?
  - Applications: InfoVis, annotated data or images

- **Requirements:**
  - Interest in user interface design and information visualizations
  - User study
  - (Good programming skills)
S7: Gaze-supported Multitouch Interaction

- **Goal:**
  - Imagine suitable combinations of multitouch gestures and head / gaze information
  - How could a user’s visual attention support the interaction with tabletops?

- **Features:**
  - Concept for gaze-supported multitouch interaction techniques
  - Testing derived techniques with a specific test application
  - Application areas: Collaborative work, Manipulation of 3D objects, Diagram editing

- **Requirements:**
  - Interest in user interface design and information visualizations
  - Very good programming skills (C#)
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Questions?

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