

Module Description

Advanced User Interfaces

General Information
Number of ECTS Credits

3

Abbreviation

TSM_UsInf

Version

3.2.2016

Responsible of module

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Language

	Lausanne	Bern	Zürich
Instruction	<input checked="" type="checkbox"/> E <input checked="" type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Documentation	<input checked="" type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Examination	<input checked="" type="checkbox"/> E <input checked="" type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input checked="" type="checkbox"/> D <input checked="" type="checkbox"/> E

Module category

- Fundamental theoretical principles
- Technical/scientific specialization module
- Context module

Lessons

- 2 lecture periods and 1 tutorial period per week
- 2 lecture periods per week

Brief course description of module objectives and content

Graphical User Interfaces have long become standard UIs for computers, and mobile devices have not only adopted these GUIs but augmented them with multi-touch screens, speech in- and output, gesture and handwriting recognition as well as several additional sensors. This has fostered innovative ways of user interaction with the information available on these devices that were only seen in professional environments so far. In the professional environment the trend has further developed into more and more immersive systems where the user dives more or less completely into a virtual world in order to efficiently interact with the vast amount of available information. In these scenarios, haptic interaction plays a major role.

This module gives a solid introduction into the fundamental concepts and techniques of both advanced user interfaces with different input and output channels and interaction modalities as well as immersive systems with haptic interaction. Insight into the development of these advanced user interfaces and immersive systems will be given through hands-on exercises and a lab visit.

Aims, content, methods
Learning objectives and acquired competencies

Students attending this module

- have complemented their knowledge about the user-centered GUI design process and its major activities
- are familiar with a wide range of non-standard and advanced user interfaces and can discriminate and explain their characteristics, strengths and limitations
- possess a sound knowledge of the principles and (potential) application areas of non-standard user interfaces such as voice, gesture-based or haptic user interfaces as well as immersive systems and technologies
- know the required components and underlying technologies for these advanced user interfaces and are able to evaluate and design simple applications
- have extended their knowledge of user-centred design and usability to environments and applications using non-standard user interfaces and can evaluate their suitability for specific tasks or projects

Contents of module with emphasis on teaching content

- The User-Centered Design Process (15%)
 - Fundamentals of Human-Computer Interaction (Recapitulation/Convergence)
 - UI Requirements Elicitation & Analysis: Stakeholders, Users, Business, Tasks and Context
 - UI Design & Evaluation: Principles, Patterns, Guidelines, and Techniques
 - Aligning with the Software Engineering process
- Recognition Based User Interfaces (35%)
 - Fundamentals of recognition-based UIs (Hidden-Markov Models, Deep Neural Networks)
 - Voice User Interface Design
 - Gesture Recognition, Handwriting Recognition
 - Multimodal Interfaces, Brain Computer Interface
- Immersive Systems (50%)
 - Fundamentals of Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) systems.
 - Technology for VR applications (human depth perception, 3D stereoscopic and volumetric displays, tracking and motion capturing technologies, locomotion interfaces)
 - Introduction to 3D computer graphics (rendering pipeline, photo-realistic and non-photo-realistic rendering, ray-tracing, particle systems, volume rendering)
 - Computer Haptics (human haptic perception, computer haptic interfaces, haptic rendering and applications)

Teaching and learning methods

- Ex cathedra
- Self study of literature / publications
- Practical exercises

Prerequisites, previous knowledge, entrance competencies

- Basic principles of human cognition and human-machine interaction
- Basic knowledge of graphical user interfaces and frameworks
corresponding to chapters 1-5, 7-8, 11 from Markus Dahm, "Grundlagen der Mensch-Computer-Interaktion", Pearson Studium, ISBN 3-8273-7175-9, 2006

Literature**Assessment****Certification requirements for final examinations (conditions for attestation)**

Attendance at practical exercises

Written module examination

Duration of exam : 120 minutes
Permissible aids: open book