Module Description, available in: EN

Advanced User Interfaces

General Information

Number of ECTS Credits

3

Module code

TSM_UseInf

Valid for academic year

2026-27

Last modification

2025-11-21

Coordinator of the module

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Explanations regarding the language definitions for each location:

- Instruction is given in the language specified for each location and module execution.
- Documentation is available in the language(s) listed for each location and module execution. If the documentation is in multiple languages, the percentage distributed is indicated (100% = all documentation provided).
- The examination, including both questions and answers, is provided entirely (100%) in the language(s) specified for each location and module execution. The exams are on-site.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

TSM Technical scientific module

Profile Recommendations

This module is recommended for the following profiles:

	Zurich
Profile	CS

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

- Basic principles of human cognition and human-machine interaction
- Basic knowledge of graphical user interfaces.

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, handwriting recognition, and several additional sensors. This has fostered innovative ways of user interaction with the information available on these devices that were only been 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 entirely into a virtual world to interact with the vast amount of available information efficiently. In these scenarios, true hand tracking is gaining significant momentum vs. glove-based tracking systems.

This module gives a solid introduction to 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 developing these advanced user interfaces and immersive systems with hand-tracking interaction will be given through hands-on exercises.

Aims, content, methods

Learning objectives and competencies to be acquired

Students attending this module

- have complemented their knowledge about the user-centered UI 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

Module content with weighting of different components

- 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 (45%)
  - Fundamentals of recognition-based interaction and pipelines (from raw input signals to interpreted user actions)
  - Statistical pattern classification for input recognition (HMMs, DNNs; handling uncertainty and errors)
  - Modern neural and sequence models as recognizers (for text, speech, and other sensed input)
  - Conversational user interfaces (design principles, dialog flows, prompts, and personas)
  - Implementation and evaluation of conversational and multimodal UIs (frameworks, APIs, UX considerations)
- Immersive Systems (40%)
  - 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)
  - PC-based VR system vs. stand-alone VR systems based on Android and iOS, cross-platform development
  - Use of game engines like "Unity" and "Unreal Engine"
  - Sonification

Teaching and learning methods

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

Literature

Assessment

Additional performance assessment during the semester

The module contains additional performance assessment(s) during the semester. The achieved mark of the additional performance assessment(s) applies to both the regular and the resit exam.

Description of additional performance assessment during the semester

The labs are graded. The overall grade of the labs accounts for 20% of the final module grade.

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

No electronic aids permitted

Other permissible aids

- Slides

- Own lecture notes

Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final permissible aids prior to the exam session.

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

No aids permitted