

List of Questions TAI

Date: Wednesday, January 20, 2015

This list of questions serves to prepare for the TAI exam. It intends to give students an impression about possible questions to come up in the oral exam. Hint: In oral exams, examiners like to ask open questions that – depending on the respective answer – get closer. Thus, after answering an open question (e.g. as stated in the list of questions), it is recommended to be well prepared to closed, more targeted questions.

Lecture 1 (Introduction)

So far, there is no list of questions available for this lecture (but this does not mean that the exam does not contain any questions about lecture 1).

Lecture 2

Which depth cues in real / virtual worlds do you know?

Which possibilities do you know to improve depth perception in virtual worlds?

Explain illustrative visualization techniques to improve depth perception in virtual worlds.

Name important technical parameters and restrictions of 3D input devices.

Explain the difference between isotonic and elastic sensors.

Why are the degrees of freedom for 3D input devices often separated and nonparallel?

Lecture 3

What is the relation between 3D user interfaces and natural user interfaces?

What are criteria to be used for comparing 3D input devices?

Compare isotonic and elastic sensors w.r.t. their working principle and applications?

Why the separation of DOFs may be an advantage over integrated DOFs?

Name three 3D input devices that are used on a support surface and briefly explain them.

What are the major methods for tracked user input? How do they compare w.r.t. the working space they enable?

Name four hand-held 3D input devices.

What are application areas for data gloves and finger tracking?

What are challenges involved in using data gloves?

What is a force feedback device?

How can system control be performed in immersive virtual environments?

Lecture 4

What are Light Field Displays? Name current technical challenges.

What is the difference between L-Bench and CAVE?

Name and explain basic principles of stereo projection. Consider stereo and autostereoscopic devices and explain how the stereo impression is actually achieved.

Name and explain the working principle of one type of VR glasses

State technical difficulties with full dome projections. How could a stereoscopic visualization be enabled in this context?

What are ghost images? Where do they appear?

What are technical limitations of holographic displays?

End 3D interactions techniques (hardware)

Explain the difference between summative and formative evaluation.

What is a 3D widget? What are handles used for? Which problems occur with 3D widgets compared to 2D widgets? How should 3D widgets be designed?

Which requirements must be fulfilled to guarantee affordance of 3D widgets?

Why do state transition graphs often make sense for the design of 3D widgets?

Which direct selection techniques do you know? Which problems exist when selecting 3D objects? When are sophisticated selection techniques required?

Explain the difference between virtual hand and ray casting.

Lecture 5 (3D Manipulation Techniques)

Rotation

What are virtual trackballs used for? Which problems can often be observed during their use?

What is transitivity in connection with 3D manipulation techniques?

Specify requirements for 3D rotation techniques.

How can a rotation technique be evaluated?

What is the difference between within-subject design and between subject design? Specify challenges / disadvantages of the between-subject design.

Placement

Explain user expectations for 3D placement techniques.

Which basic 3D placement tasks can be distinguished?

State examples for constraints with 3D snapping.

When are performance problems expectable during the placement of objects (especially during snapping)? Specify reasons.

Besides snapping, which techniques are used for the improvement of 3D object placements?

Lecture 6

Navigation

Which 3 types of navigation tasks do you know?

What are landmarks good for? Which types of landmarks do you know?

Name examples for implicit landmarks and explicit landmarks / navigation instructions, respectively.

Specify requirements for explicit navigation instructions on the example of labeling in maps.

What is counter balancing in connection with user studies?

Which factors are of practical relevance for virtual running?

State examples for metaphors in *guided navigation*. Why and when does automatic navigation play an important role?

Advanced 3D Interaction

What are virtual lenses used for?

Specify an example for lenses in 3D interaction. Why are NPR techniques used here?

What is the difference between cutaways and ghost views?

What is a spotlight manipulator used for? How could it be modeled?

Which challenges exist for the placement / arrangement of 3D labels? Which possible solutions do you know?

How would you design a label rearrangement for 3D rotations?

Lecture 7+8 Tracking I +II

How many fps are usually required for a realistic, haptic feedback?

Name advantages and disadvantages of the different tracking methods.

What is the integrational drift? Where and when does it occur? How could it be minimized?

Which characteristics of markers for optical tracking should ideally be known to a tracking system?

What is the difference between active and passive IR tracking systems?

What is the disadvantage of active LED markers?

What is the disadvantage of passive markers during IR-based tracking?

How many markers are necessary for (marker-based) optical tracking?

How does tracking work by means of structured light? Which condition is necessary for this? Where and how is this technique applied?

Upon which principle are TOF cameras based? Which problems might occur during the generation of depth maps?

Explain the components of an EM tracking system and their functionality. Which advantages and limitations exist with this procedure, e.g. compared to optical tracking procedures?

Lecture 9+10 Augmented Reality I+II (questions are partly taken from the AR / VR book, Dörner et al. 2014)

Define AR. What is mixed reality in this context? Which output modalities for AR exist?

What is a magic lens effect? How can a conditional magic lens effect be achieved?

Which constraints emerge for optical-see-through/video-see-through/projector-based AR and why?

Which problems arise for prism-based optical-see-through devices?

How could these constraints be attenuated and avoided, respectively?

What is the difference between tracking and registration?

Which problem arises during outdoor tracking in inner cities and which solutions exist? What is the difference between D-GPS and A-GPS? What would be a solution for mobile indoor tracking?

Find an example for a meaningful hybrid tracking application. Name a main challenge in sensor fusion.

What is geometric and photometric registration? How are they realized?

Which effects has an erroneous geometric and photometric registration, respectively to the user experience?

What are the advantages of video see-through displays compared to optical see-through displays? What are the disadvantages?

How could latency-related effects be reduced in video-see-through AR?

Which role plays the size of the FOV for selection of a display for an AR application? What problems may arise with small FOV? Explain different construction methods.

Why are phantom objects required in AR? What is the consequence of missing or erroneous phantom objects? How can phantom objects be created?

What are TUIs? Why/Where are they applied? Give one example each for their application by using direct as well as indirect interaction techniques.

Why can change blindness be problematic for AR application?

Lecture 11+12 Gestural Interaction I+II

Why do we need interaction methods that go beyond WIMP interfaces? (constraints of WIMP)

Which special characteristics has language as input modality? What are current problems/ challenges regarding speech input?

Which aspects must be fulfilled by NUIs?

Which types of gestures exist and which of them can be used in interfaces?

Which phases must be considered?

How does natural interaction differ from interaction with computers and gestures?

Which characteristics should a gesture set have?

How can gestures be classified?

Which advantages and disadvantages do different gestures have in terms of fatigue, gesture recognition, precision and gesture spectrum?

What are general advantages and disadvantages of gesture-based interaction?