INFOMMMI (Multimodal Interaction) 2015-2016

Exam questions for part 2

(max. 40 points)

FIRST NAME:	LAST NAME:	STUDENT ID:

Please write your answers for these questions only on the pages for this part!

Don't forget to fill in your name and student ID in the dedicated boxes above on <u>both</u> parts!

Question 2-1: Virtual reality definitions (max. 8 points)

In the paper "Defining Virtual Reality: Dimensions Determining Telepresence" by Steuer (1992) the author introduces a "variable-based definition" of VR, in which he describes different systems with respect to their *vividness* and *interactivity*.

a) What are the two variables contributing to the vividness of a system?

(Note: It is sufficient to just write down the name of the two variables. Explanations are not required.)

b) Give one example from VR or AR for each of the following variables that further specify the interactivity of a VR (or AR) system.

b1) Speed:

b2) Range:

b3) Mapping:

(Note: Although Steuer's definition is for VR and not AR, the related variables and characteristics can be applied to AR systems, too. Hence, you can give examples from either VR or AR. A detailed explanation is not required. Your result should just illustrate that you understood what this term means a) in general and b) in context with VR/AR; for example, something like this: "Range describes … For example, a VR system where … has a low range.")

Question 2-2: AR-VR comparison (max. 2 points)

AR is often referred to as "harder to create" than VR. Give one concrete example that supports this claim.

(Note: No detailed explanation is needed. It is sufficient to give a short sentence illustrating the issue that might be more difficult to realize and why.)

Question 2-3: Augmented reality definitions & non-visual AR (max. 9 points)

The Chewing Jockey system by Koizumi et al. (2011) describes a setup where jaw motions during chewing are translated into sound signals with the purpose of changing your perception or experience during chewing. Although the authors never introduced their approach as an AR system, to some degree it can be seen as type of non-visual AR. Shortly discuss this with respect to the three characteristics introduced in the AR definition by Azuma (1997).

1)   Requirement:

Discussion:

2)   Requirement:

Discussion:

3)   Requirement:

Discussion:

(Note: For the requirement, it is sufficient to write down the respective terms specified by Azuma. An explanation is not required. For the discussion, no lengthy description is needed. It is sufficient to give a short sentence illustrating that you understood what this requirement means and if or to what degree it is fulfilled in the Chewing Jockey system.)

Question 2-4: Sensor technology (max. 4 points).

In 3D, orientation can be described by rotations around the three axis.

a) What are the three technical terms for these rotations?

b) Which of these three rotations cannot be measured with an accelerometer and why?

(Note: Three words and one sentence are sufficient to answer questions a) and b), respectively)

Question 2-5: Handheld AR (max. 9 points).

The image on the left shows a handheld AR system implemented on a state-of-the-art smartphone, where information that is related to the direction where the phone is pointing at is superimposed onto the live video stream of the phone's away-facing camera.

a) What kind of sensors are needed to realize such a system?

b) Shortly discuss this type of AR with respect to the three requirements for an AR system specified by Azuma (1997).

1st requirement:

2nd requirement:

3rd requirement:

(Note: A short description, similarly to the discussions in question 2-3 is sufficent.)

Question 2-6: Display technology (max. 4 points).

Optical see-throughs (OST) and video-see-throughs (VST) are two types of head-mounted displays (HMD) that can be used to create AR. Write down for which technology the following statements are true (OST, VST, both, or none/it depends).

    a) This type of HMD can add and subtract light.

    b) It is important that this HMD has very low latency in order to a create a comfortable and convincing AR experience.

    c) Registration in 3D is harder with this type of HMD.

    d) This type of HMD creates a better, more realistic type of AR than the other one.

(Note: No explanation required. It is sufficient to write down either "OST", "VST", "both", or "none".)

Question 2-7: AR/VR application and comparison of systems (max. 4 points).

The IllumiRoom system from Microsoft Research uses a data projector to project game-related content on the wall surrounding your TV screen when playing a game on that screen. It can be considered as a special type of spatial AR.

Assume you are a game developer or designer who has to create a car racing game with a first person view (i.e., the scene that the player sees is similar to the view of a race car driver during the race) for a company that wants to use this game to entertain people at fairs and other public events. In your team you are now discussing if you should use the IllumiRoom setup to create such a game or a VR setup with an HMD (e.g., the Oculus Rift).

Give one good reason that speaks in favor of using the IllumiRoom setup and against the VR HMD setup, and one good reason that speaks in favor of using the VR HMD setup and against the IllumiRoom setup.