INFOMMMI (Multimodal Interaction) 2014-2015

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 on both 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 definition of VR, where human experience is assumed to be influenced by two major aspects (or "dimensions") of the used technology. One of these aspects is *vividness*. The two most important variables contributing to vividness are sensory *breadth* and sensory *depth*.

a) What is the second aspect (or "dimension")?

b) What are the three most important variables or factors contributing to this second aspect?

(Note: It is sufficient to write down the aspect and the three variables. Explanations are not required.)

Assume a 3D virtual world simulated on a PC at a resolution of 1280x1024 pixels and using stereo sound.

c) Give one example how the vividness of this system could be increased by improvements with respect to the depth variable.

d) Give one example how the vividness of this system could be increased by improvements with respect to the breadth variable.

(Note: Detailed explanations are not required, but a short example illustrating that you understood the meaning of these two variables could be sufficient to get full credit.)

Question 2-2: Comparison of VR implementations (max. 4 points)

In Demiralp et al. (2006)[1], the authors present a comparative study between CAVE and Fish tank virtual reality displays demonstrating that the latter achieved better qualitative as well as quantitative results. However, the study published by Prabhat et al. (2008)[2], where the authors compared Desktop, Fish tank, and CAVE systems, led to a different result with the CAVE system outperforming both other systems.

Give two reasons why this may have been the case.

(Note: In their paper, Prabhat et al. provide four possible reasons. You do not have to explicitly rephrase those, but other possible (and convincing!) explanations may be sufficient to get full credits for this question.)

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[1] Demiralp et al. (2006) "CAVE and Fishtank Virtual-Reality Displays: A Qualitative and Quantitative Comparison"
[2] Prabhat et al. (2008) "A Comparative Study of Desktop, Fishtank, and Cave Systems for the Exploration of Volume Rendered Confocal Data Sets"

Question 2-3: Mobile VR (max. 8 points)

Modern smart phones contain various sensors, such as cameras (usually one facing the user and one at the back of the device), accelerometers, digital compass, etc. enabling us to implement various virtual reality concepts on such mobile devices.

a) What kind of sensor is needed to implement Fish tank VR on mobiles?

(Note: It is sufficient to name the sensor. An explanation is not required.)

b) What kind of sensor is needed to implement Shoebox VR on mobiles?

(Note: It is sufficient to name the sensor. An explanation is not required.)

c) Give one advantage of Fish tank VR over Shoebox VR on mobiles.

(Note: A short description of the characteristic could be sufficient to gain full credits for this question.)

d) From computer graphics, we know that there are several depth cues contributing to depth perception. Name one depth cue that may be responsible for better depth perception when using Shoebox VR instead of standard 3D graphics on a mobile device.

(Note: It is sufficient to name the respective cue. An explanation is not required.)

Question 2-4: Augmented reality (max. 14 points)

a) Explain the difference between immersive and non-immersive augmented reality.

(Note: A short description, e.g., two short sentences explaining what immersive and non-immersive AR is could be sufficient to get full credits for this question.)

b) Give an example technology that can be used to create a non-immersive augmented reality.

(Note: You just have to name the used technology/devices. An explanation is not required.)

c) Give one advantage and one disadvantage of video-see-through HMDs compared to optical-see-through HMDs.

(Note: Most advantages / disadvantages have been discussed in the AR overview paper by Carmigniani et al. (2011). Yet, you are welcome to provide alternative ones. A short description is sufficient.)

d) Name two potential disadvantages of tangible AR interfaces.

(Note: We didn't address these in the lectures explicitly. Yet, if you remember the advantages/disadvantages for other interaction approaches that we discussed in the course, you should not have a problem answering this question. The paper on AR board games by Huynh et al. (2009) also mentions a few related issues.)

Question 2-5: Augmented spaces & mixed environments (max. 6 points)

The IllumiRoom is a proof-of-concept system that augments the area surrounding a television with projected visualizations. In their paper Jones et al. (2013) investigate "how projected visualizations in the periphery can negate, include or augment the physical environment, and thus enhance the content displayed on the television screen. Give one good example for each of these three cases.

a) Negating the physical environment:

b) Including the physical environment:

c) Augmenting the physical environment:

(Note: You do not have to provide the same examples presented in the paper but are welcome to provide your own ideas. Keep in mind though that it is asked for a "good example", i.e., your example needs to be convincing and make sense.)