FINALS: CS677 Artificial Reality – Human Computer Interaction

Sudhanshu Kumar Semwal
Department of Computer Science,
Phone: 262-3545, e-mail: semwal@eas.uccs.edu

25 Percent of the Grade, Due Date Tuesday May 10th, 2007 7 p.m. or earlier

1 ABOUT THE FINALS

It is very important that you do the finals by yourself. In case you have to discuss questions, then please do not discuss the answers with your fellow students. I am interested in *your* answer. If you have any questions, please feel free to call me at 262-3545, or e-mail at semwal@eas.uccs.edu.

It will help me tremendously if papers are typewritten (double spaced, 10-12 points format). Please also check for spelling mistakes.

Explain clearly whenever you are making a claim. Please do not say *"refer pp. of the Text Book or Proceedings for better explanation."* Organize your answers properly. Read them for clarity before submitting the final copy.

Limit yourself to the page-limit which I have indicated at the end of every question. This is only for your guidance. The suggested strategy (to answer these questions) is to use the material covered in the class and then describe in your own words.

State your assumptions, if any.

Thank you for your time and efforts. I enjoyed the class. GOOD LUCK.

2 PART A

- **Question 1**: (10 points) (Chapter One Seventeen senses; Sense of Taste; Proprioceptive sense) Explain one application of a VE where sense of taste and proprioception might be useful. Assume that full 3D graphics, sound, tracking, and haptic interaction are at our disposal as well. (two pages).

- **Question 2**: (15 points) (Video touch; Universality of Facial Expression) Explain the significance of video-Touch and video-place system of Dr.

Krueger. This idea will become powerful if emotions can be understood by a computer. Conflicting views have been presented in the class about the universality of facial expressions across age, gender, and cultures and difficulty of computationally recognizing the facial expressions. Where do you think facial expressions might be useful as an input to a human-computer interface? Explain one area of application. (two pages).

3 PART B: RESEARCH SECTION

These questions would be graded on the basis of the approach you would take. The answers must reflect your analysis. You should not look for some articles in the library. Your answer should not be more than five pages long (six when counting the figures).

3.1 Question 3: (25 points) Olfactory in Virtual Environments: A new system (40 points) Spot-Scent; Wearable Olfactory Display; Movie with scents paper etc

(a) (5 points) Explain the connection between sense of smell and emotions/memory? Is there a direct effect of smell on emotions and memory? (b) (5 points) One applications of the scents is being applied during the media presentation. What are then sense of smell applications for the media technology. Explain the basic idea of the olfactory paper for movie presentation. (c) (5 points) Discuss the drawback of the sense of smell applications – is there use for this kind of technology? Consider the fact that experiments may not be consistently repeatable. (d) (5 points) Consider the case of multiple participants in the same room. We may want to provide different, customized sense of smell experience for different participants. Consider a museum applications where groups and crowds are formed in different ways in front of the exhibits. How can scent be used to attract and disperse the crowds? We need to consider precise delivery of scent versus general applications. (e) (5 points) Can scents be used for delivery of secret messages in a hostile environment such as defense applications?

State your assumptions, if any. (Page limit: six pages).

3.2 Question 4: (50 points)(ForceTactile feedback Chapter from Burdea's book, Compact Master Manipulator by Hiroo Iwata, Electrorheological Tactile Display by Monkman; An Application for the Visually Impaired; ARToolKit; Scan&Track system; Holoport paper VR'06; Six degree of freedom god-object method for haptic display of rigid bodies))

We performed several experiments using ARToolKit and found out that ARToolKit can detect simple patterns most of the time accurately. Sometimes if the angle is very acute then detection could be a problem. In addition, the distance from the pattern can also be a limitation as that is inherent problem of camera-based systems. Some benefits of ARToolKit are: cross platform availability, cheap pattern creation, and possibility of mobile systems with simple camera activation. We would next like to combine ARToolKit with the Scan&Track system to create teleconferencing for visually impaired person. *We would like to add haptic-display technology for both input and output displays for the visually impaired person as they tele-conference with other team members. (a) (10 points) Suggest methods to use force feedback like PHANTOM-force feedback help with conveying the gaze of participants so that gaze-cues can be provided to the visually impaired.*

Lets us assume that we can recognize two unique patterns in an ARToolKit environment. Recognition provides a position and estimate of 3-axes of the pattern. We can now use geometric relationships: e.g. consider one pattern in the middle, then the second pattern can be to the left, right, above and below of this pattern. *(b) (10 points) How many combinations of these patterns can be generated by using two patterns in the above-mentioned way.*

On the other hand, Scan&Track system can apply active-space indexing method to any area. These areas are called *active spaces*. The benefit of active-spaces is that there is no marking used allowing haptic device to be used freely in an active space. *(c) (20 points) Explain a method where a visually impaired person could use a haptic-display like a force feedback device to navigate through active space to teleconference with others. In other words, create an interaction paradigm for team members to communicate using haptic devices using simple patterns of ARToolKit in an active space indexing environment.*

(d) (10 points) Explain the major drawback and benefit of your using ARToolKit and Scan&Track system for teleconferencing for the visually impaired.

State your assumptions, if any. (Page limit: six pages).

4   Final Comments

I hope you have obtained a glimpse of *research areas* in Artificial Reality and Virtual Reality through this course. Remember the deadline of Tuesday May 10th, 2007 7 p.m. or earlier.

GOOD LUCK AND ENJOY THE FINALS!!