15-464/15-664: Reference List for April 19, 2017

We began by talking about how VR has been around for quite some time. Many say it officially began with Ivan Sutherland and Bob Sproull's "Sword of Damocles" headset dating from 1968
https://sr789.files.wordpress.com/2007/11/swordd.jpg

Perhaps this time around, VR will sustain widespread use, due to advancements in technology including the reduction of latency. This guide from Oculus gives a very good overview of practical issues to consider when setting up a VR application:

Oculus best practices guide
https://developer3.oculus.com/documentation/intro-vr/latest/concepts/book-bp/

We looked specifically at the issue of keeping disparity low, at some cost in depth range in your environment. Here are a couple of papers that consider this issue. Of special note is how we can improve viewer experience if we can always predict ahead of time what they will look at.

Oskam T, Hornung A, Bowles H, Mitchell K, Gross MH. OSCAM-optimized stereoscopic camera control for interactive 3D. ACM Trans. Graph.. 2011 Dec 12;30(6):189.
https://graphics.ethz.ch/publications/papers/paperOsk11.php

Koulieris GA, Drettakis G, Cunningham D, Mania K. Gaze prediction using machine learning for dynamic stereo manipulation in games. InVirtual Reality (VR), 2016 IEEE 2016 Mar 19 (pp. 113-120). IEEE.
http://www-sop.inria.fr/reves/Basilic/2016/KDCM16/

This paper addresses the problem of fooling a user into thinking a space is larger than it is:

Sun Q, Wei LY, Kaufman A. Mapping virtual and physical reality. ACM Transactions on Graphics (TOG). 2016 Jul 11;35(4):64.
http://dl.acm.org/citation.cfm?id=2925883
http://www.liyiwei.org/papers/vr-sig16/

https://www.youtube.com/watch?v=YK9m0wkwjTE&feature=youtu.be

For a room sized VR experience, it is interesting to take a look at John Hollerbach's lab at the University of Utah.

Hejrati B, Crandall KL, Hollerbach JM, Abbott JJ. Kinesthetic force feedback and belt control for the treadport locomotion interface. IEEE transactions on haptics. 2015 Apr 1;8(2):176-87. http://ieeexplore.ieee.org/abstract/document/7042795/

Kulkarni SD, Fisher CJ, Lefler P, Desai A, Chakravarthy S, Pardyjak ER, Minor MA, Hollerbach JM. A full body steerable wind display for a locomotion interface. IEEE transactions on visualization and computer graphics. 2015 Oct 1;21(10):1146-59. http://ieeexplore.ieee.org/document/7089286/

http://www.quizover.com/oer/course/locomotion-interface-for-outdoor-virtual-by-john-m-videolectures

Interfaces and interactions may change dramatically in VR, and this paper gives one small look at freehand sketching:

Jackson B, Keefe DF. Lift-Off: Using Reference Imagery and Freehand Sketching to Create 3D Models in VR. IEEE transactions on visualization and computer graphics. 2016 Apr 21;22(4):1442-51.
http://ieeexplore.ieee.org/abstract/document/7383322/
https://www.youtube.com/watch?v=gOmAF6-rnCo&feature=youtu.be

One of the remaining grand challenges is hand / object interaction.   This paper indicates that the technology for simulating hand deformations is getting close.

Hirota K, Tagawa K. Interaction with virtual object using deformable hand. InVirtual Reality (VR), 2016 IEEE 2016 Mar 19 (pp. 49-56). IEEE.
http://ieeexplore.ieee.org/abstract/document/7504687/
https://www.youtube.com/watch?v=b-FHpID8gck

But what technology do we want to provide us with haptic feedback?   The jury is still out on this one.   The Oculus touch is one state of the art reference point.   The SIGGRAPH course listed below gives interesting ideas for the future, including pulsed ultrasound for touch at a distance.

Oculus touch
http://www.ign.com/articles/2016/12/05/oculus-touch-controllers-review

Otaduy MA, Okamura A, Subramanian S. Haptic technologies for direct touch in virtual reality. InACM SIGGRAPH 2016 Courses 2016 Jul 24 (p. 13). ACM.
http://dl.acm.org/citation.cfm?id=2927307