15-464/15-664 Reference List for April 3, 2019

We started by looking at texture transfer for stylized facial performance.

Fišer, Jakub, Ondřej Jamriška, David Simons, Eli Shechtman, Jingwan Lu, Paul Asente, Michal Lukáč, and Daniel Sýkora. "Example-based synthesis of stylized facial animations." *ACM Transactions on Graphics (TOG)* 36, no. 4 (2017): 155.
http://dcgi.felk.cvut.cz/home/sykorad/facestyle.html

A common artist approach to handling facial animation is blend shapes. One recent result in puppeteering cartoon faces using blend shapes is shown in this paper:

Zell, Eduard, J. P. Lewis, Junyong Noh, and Mario Botsch. "Facial retargeting with automatic range of motion alignment." *ACM Transactions on Graphics (TOG)* 36, no. 4 (2017): 154.
https://dl.acm.org/citation.cfm?id=3073674
https://www.gameanim.com/2017/06/26/facial-retargeting-automatic-range-motion-alignment/

Blend shapes can be augmented with physical simulation to add realism in dynamic situations. This paper describes how to do this by having artists paint material stiffness on the face, which may be expression dependent.

Kozlov, Yeara, Derek Bradley, Moritz Bächer, Bernhard Thomaszewski, Thabo Beeler, and Markus Gross. "Enriching facial blendshape rigs with physical simulation." In *Computer Graphics Forum*, vol. 36, no. 2, pp. 75-84. 2017.
https://onlinelibrary.wiley.com/doi/full/10.1111/cgf.13108
https://www.youtube.com/watch?v=g4bo3g9pPZw

Researchers continue to pursue a fully physically based approach due to the possibility of doing surgical and other physical enhancement applications. This paper gives a recent example.

Ichim, Alexandru-Eugen, Petr Kadleček, Ladislav Kavan, and Mark Pauly. "Phace: Physics-based face modeling and animation." *ACM Transactions on Graphics (TOG)* 36, no. 4 (2017): 153.
https://lgg.epfl.ch/publications/2017/Phace/index.php

Muscle based models are used in the entertainment industry, but primarily as a tool to allow artists to create highly realistic facial expressions. This short paper gives insights from a muscle model put together for Kong.

Lan, Lana, Matthew Cong, and Ronald Fedkiw. "Lessons from the evolution of an anatomical facial muscle model." In *Proceedings of the ACM SIGGRAPH Digital Production Symposium*, p. 11. ACM, 2017.
https://dl.acm.org/citation.cfm?id=3105693

https://www.youtube.com/watch?v=o7vdjxDDGag

The next paper we looked at tackles the problem of capturing a facial performance with enough detail (including the dynamics of blood flow within the face) in order to be able to accurately render that performance under various lighting conditions.

Gotardo, Paulo, Jérémy Riviere, Derek Bradley, Abhijeet Ghosh, and Thabo Beeler. "Practical dynamic facial appearance modeling and acquisition." In *SIGGRAPH Asia 2018 Technical Papers*, p. 232. ACM, 2018.
https://dl.acm.org/citation.cfm?id=3275073
https://www.youtube.com/watch?v=rzVtkNHzSVs

The following paper addresses the problem of puppeteering a realistic avatar created from a limited number of RGBD images. The use case is adjusting appearance in an situation such as video conferencing.

Thies, Justus, Michael Zollhöfer, Christian Theobalt, Marc Stamminger, and Matthias Nießner. "Headon: real-time reenactment of human portrait videos." *ACM Transactions on Graphics (TOG)* 37, no. 4 (2018): 164.
http://niessnerlab.org/projects/thies2018headon.html

Finally, we looked at the Oculus / Facebook research on obtaining very accurate renderings which can be generated from such inputs as the cameras mounted on an Oculus headset.

Stephen Lombardi, Tomas Simon, Jason Saragih, and Yaser Sheikh, "Deep Appearance Models for Face Rendering," *ACM Transactions on Graphics (TOG)*, 2018.
https://www.youtube.com/watch?v=3IZ2KGH1lR0
https://www.wired.com/story/facebook-oculus-codec-avatars-vr/

We then turned briefly to the topic of hair. We began with this Disney paper on control of hair behavior.

Milliez, A., R. W. Sumner, M. Gross, and B. Thomaszewski. "HairControl: A Tracking Solution for Directable Hair Simulation." In *Computer Graphics Forum*, vol. 37, no. 8, pp. 115-123. 2018.
https://cgl.ethz.ch/publications/papers/paperMil18a.php

This paper builds on the following early paper which is a good reference for basic spring mass hair simulation.

Rosenblum, Robert E., Wayne E. Carlson, and Edwin Tripp III. "Simulating the structure and dynamics of human hair: modelling, rendering and animation." *The Journal of Visualization and Computer Animation* 2, no. 4 (1991): 141-148.
https://onlinelibrary.wiley.com/doi/abs/10.1002/vis.4340020410

For a broad overview of approaches to hair capture, style representation, and simulation, have a look at this survey:

Ward, Kelly, Florence Bertails, Tae-Yong Kim, Stephen R. Marschner, Marie-Paule Cani, and Ming C. Lin. "A survey on hair modeling: Styling, simulation, and rendering." *IEEE transactions on visualization and computer graphics* 13, no. 2 (2007): 213-234.
https://ieeexplore.ieee.org/abstract/document/4069232

On the simulation side, one significant area of study has been in how to handle curly hair, such as demonstrated in this paper.

Iben, Hayley, Mark Meyer, Lena Petrovic, Olivier Soares, John Anderson, and Andrew Witkin. "Artistic simulation of curly hair." In *Proceedings of the 12th ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 63-71. ACM, 2013.
https://dl.acm.org/citation.cfm?id=2485913
https://www.youtube.com/watch?v=UjHB-pHZwsk

We then looked very briefly on a collection of recent papers on the topic of 3D capture of hair detail from images and video.

Liang, Shu, Xiufeng Huang, Xianyu Meng, Kunyao Chen, Linda G. Shapiro, and Ira Kemelmacher-Shlizerman. "Video to fully automatic 3D hair model." In *SIGGRAPH Asia 2018 Technical Papers*, p. 206. ACM, 2018.
https://dl.acm.org/citation.cfm?id=3275020
http://grail.cs.washington.edu/projects/hair/

Saito, Shunsuke, Liwen Hu, Chongyang Ma, Hikaru Ibayashi, Linjie Luo, and Hao Li. "3D hair synthesis using volumetric variational autoencoders." In *SIGGRAPH Asia 2018 Technical Papers*, p. 208. ACM, 2018.
http://linjieluo.com/publications/3d-hair-synthesis-using-volumetric-variational-autoencoders/

Zhou, Yi, Liwen Hu, Jun Xing, Weikai Chen, Han-Wei Kung, Xin Tong, and Hao Li. "HairNet: Single-View Hair Reconstruction using Convolutional Neural Networks." In *Proceedings of the European Conference on Computer Vision (ECCV)*, pp. 235-251. 2018.
https://neurohive.io/en/state-of-the-art/3d-hair-reconstruction-out-of-a-single-image/