15-464/15-664 Reference List for April 17, 2019

We started with two papers that utilized Gaussian Process Latent Variable Models (GPLVMs) to place motion capture data into a reduced dimensional latent variable space in order to create smooth variations in character pose that stayed near to the input motion data. These are some early learned models for character IK and character control.

Grochow, Keith, Steven L. Martin, Aaron Hertzmann, and Zoran Popović. "Style-based inverse kinematics." In *ACM transactions on graphics (TOG)*, vol. 23, no. 3, pp. 522-531. ACM, 2004. http://grail.cs.washington.edu/projects/styleik/

Levine, Sergey, Jack M. Wang, Alexis Haraux, Zoran Popović, and Vladlen Koltun. "Continuous character control with low-dimensional embeddings." *ACM Transactions on Graphics (TOG)* 31, no. 4 (2012): 28. https://graphics.stanford.edu/projects/cccIde/

We looked at this paper on learning bicycle stunts which utilizes custom built neural networks for each stunt. One interesting aspect of this paper is that the goal is to create the simplest possible networks to perform the stunt. A second interesting aspect of the paper is that the motions are simulated, and the networks are learning control parameters for the simulations.

Tan J, Gu Y, Liu CK, Turk G. Learning bicycle stunts. ACM Transactions on Graphics (TOG). 2014 Jul 27;33(4):50. http://dl.acm.org/citation.cfm?id=2601121

We then looked at this paper which constructs a deep neural network model for pose prediction. Although it may have been inspired by the goal of improving tracking of human motion in videos, it also proves useful for generating motions. Motion is kept coherent by Long Short Term Memory units which retain some history of pose over time and made smoother and less prone to overfitting by using encoders to reduce the motion to a lower dimensional latent space which is then decoded for display.

Fragkiadaki, Katerina, Sergey Levine, Panna Felsen, and Jitendra Malik. "Recurrent network models for human dynamics." In *Proceedings of the IEEE International Conference on Computer Vision*, pp. 4346-4354. 2015. https://www.cs.cmu.edu/~katef/humandynamics.html

Finally, we had a closer look at the following paper, which varies neural network weights with phase of the motion, creating a character which can be controlled to walk, run, and jump through uneven terrain.

Holden, Daniel, Taku Komura, and Jun Saito. "Phase-functioned neural networks for character control." *ACM Transactions on Graphics (TOG)* 36, no. 4 (2017): 42. http://theorangeduck.com/page/phase-functioned-neural-networks-character-control