

3D Models of People
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I believe that we humans are highly visual. From my perspective, I learn best when I have the ability to see something, rather than just trying to visualize a concept on my own. I have taken a look into research that seeks to understand different poses of a human, and the research seeks to then use this data to quickly generate sample poses of a character on a computer.

The article *Large Scale Datasets and Predictive Methods for 3D Human Sensing in Natural Environments* looks to train computer systems that model the human figure in a realistic environment. This is a rather important to note, as what comes to mind is how early renditions of a living figure on a computer were often stick-like, lacking the visual composing of a fully grown animal like a human. And all the finer details, ratios of sizes of body parts and more came together.

These researchers posit that being able to accurately show a human can apply to many fields, from entertainment in video games to one of the areas of my work, human-computer interaction. The existing problem before this research was done is that we have complex ranges of motions as humans, and when this is captured using images, there is a lot of data that needs to be processed and analyzed. A solution is to use machine learning, by using a training set of data to then predict how the motion of a human may work. What can be learned from performing an analysis on this training data set is that once the computer has trained on a critical mass of samples, one can then start to build new example of motion and posing. An example from the paper was being able to place a human into a variety of mixed-reality backgrounds and scenes.

Which leads to the primary paper of my evaluation *Gesture3D: Posing 3D Characters via Gesture Drawings*. Once there is training on a set of human poses, it can then become predictive on how to place a new human figure within environment based on what is learned by analyzing many examples. The problem that the primary paper is trying to solve is to quickly provide examples of a pose of a realistic character with input from a creative artist. Why this is important is for the ability to save time: rather than individual sketches needing to be drawn for each pose, someone like an artist with a general idea of how a pose should look can use their algorithm to draw a rough estimate, while the algorithm does the work to populate the curves, pose, view, etc. of the actual character.

From this, gone are the days needing to have a hand drawn sketch of every single pose that a potential character could display within say a game or an animated film, or even a toy designer trying to design different poses of a new figurine.

The goal with this kind of research is to improve upon visual representations that are generated by a computer. In the past, the generated figures and characters would have an unrealistic

appearance. What is the use of model, if it is not going to model the real thing as close as possible?

Based on prior research, some researchers chose to look to machine learning, by building a large enough dataset, that when analyzed, is a critical mass for then being able to turn around and generate new models based on what was learned. Then, these future researchers could take what was learned from such an experiment, and be able to develop an algorithm that allows a designer or an artist to take one rendering of a character, provide a rough outline of the pose, and have a realistic model character be generated. It is truly remarkable to see how the mathematics and sheer volume of data is being processed to be able to teach computers to better model what is in the real world. What is concerning is that at what point will we not be able to distinguish reality from computer-generated models, characters, scenes, humans?

References:

- [1] Bessmeltsev, M., Vining, N., Sheffer, A. 2016. Gesture3D: Posing 3D Characters via Gesture Drawings. ACM Trans. Graph. 35, 6, Article 165 (November 2016), 13 pages. DOI = 10.1145/2980179.2980240 <http://doi.acm.org/10.1145/2980179.2980240>.
- [2] Catalin Ionescu, Dragos Papava, Vlad Olaru, and Cristian Sminchisescu. 2014. Human3.6M: Large Scale Datasets and Predictive Methods for 3D Human Sensing in Natural Environments. IEEE Trans. Pattern Anal. Mach. Intell. 36, 7 (July 2014), 1325-1339. DOI=<http://dx.doi.org/10.1109/TPAMI.2013.248>

Gesture3D: Posing 3D Characters via Gesture Drawings is my primary article.