Enhancing 3D Animations for Human Motion

Authors: August Bergöö, Oliver Lundgren

Imagine being able to watch your next football game from the perspective of one of the players on the pitch, all while sitting on your couch in your living room. Advancements in virtual and augmented reality (VR and AR) have opened new frontiers in various fields, including sports broadcasting. However, one of the significant challenges in this area is ensuring that 3D animations of athletes are smooth and accurate. Noisy data from pose estimation systems often results in jittery and unnatural animations, which detract from the immersive experience. Our thesis aims to address these issues by evaluating different smoothing techniques to improve the quality of 3D pose data, thereby enhancing the fluidity of animations.

When creating 3D animations for sports, the data received when capturing players movements can be noisy, leading to unnatural and shaky animations. We aimed to investigate some of the most common filtering techniques and a machine learning method to see which one works best when evaluating the result using different metrics.

We selected a range of smoothing techniques for our study, including B-Splines, the Savitzky-Golay filter, Double Exponential Smoothing, and Long Short-Term Memory (LSTM) neural networks. Each method was evaluated for its ability to reduce noise and improve the smoothness of animations. B-Spline connects a series of dots with flexible, smooth lines that reduce abrupt changes and create a fluid motion to remove unwanted noise. The Savitzky-Golay filter smooths by looking at small sections of the data and fitting them into a smooth curve, keeping important features while reducing noise. Double Exponential Smoothing is well-suited for real-time applications. It smooths the data by considering both the current level and the trend, making it great for real-time applications like live sports. LSTM models are advanced machine learning models that excel at recognizing patterns over time. They can predict and smooth out human movements by learning from sequences of data.

We used specific metrics based on positional and acceleration errors to measure how well each method reduced noise and improved smoothness. Additionally, we asked people to watch the animations and tell us which ones looked the best. Our findings showed that while all methods helped, the Savitzky-Golay filter and B-Spline smoothing were particularly effective in making the animations look natural and smooth.

By implementing our methods to process noisy estimated pose data, we can enhance the viewer's experience in these virtual environments. Whether it's for sports broadcasting, gaming, or virtual meetings, smoother animations contribute to a more immersive and realistic experience. This makes the virtual representations of people and objects feel more lifelike and engaging.