Computer Animation Assignment 2: Motion Capture Interpolation

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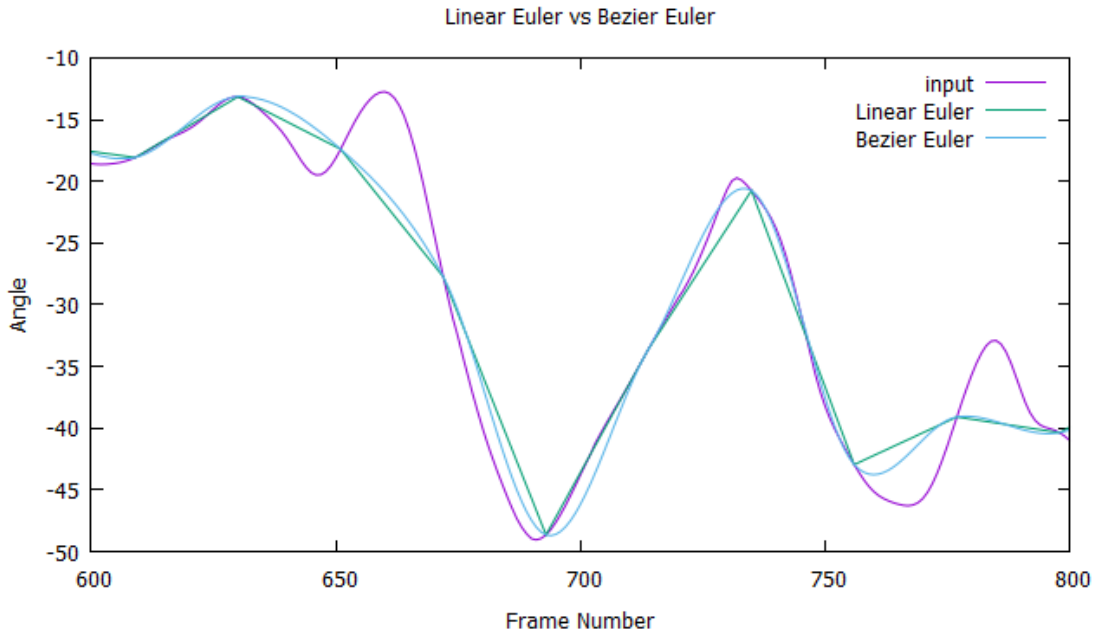
Dev Environment: Microsoft Visual Studio 2013 on Windows 7 x64

Implementation: \code\mocapPlayer-starter

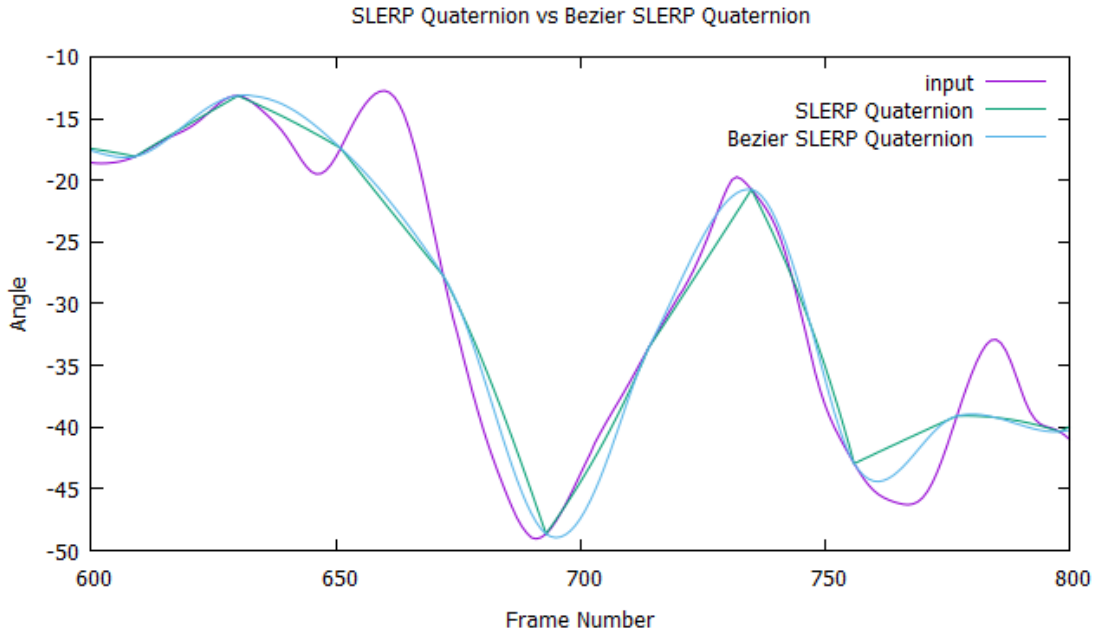
(I only upload the code to make the package smaller)

Animation: \image\image_martialArts.7z

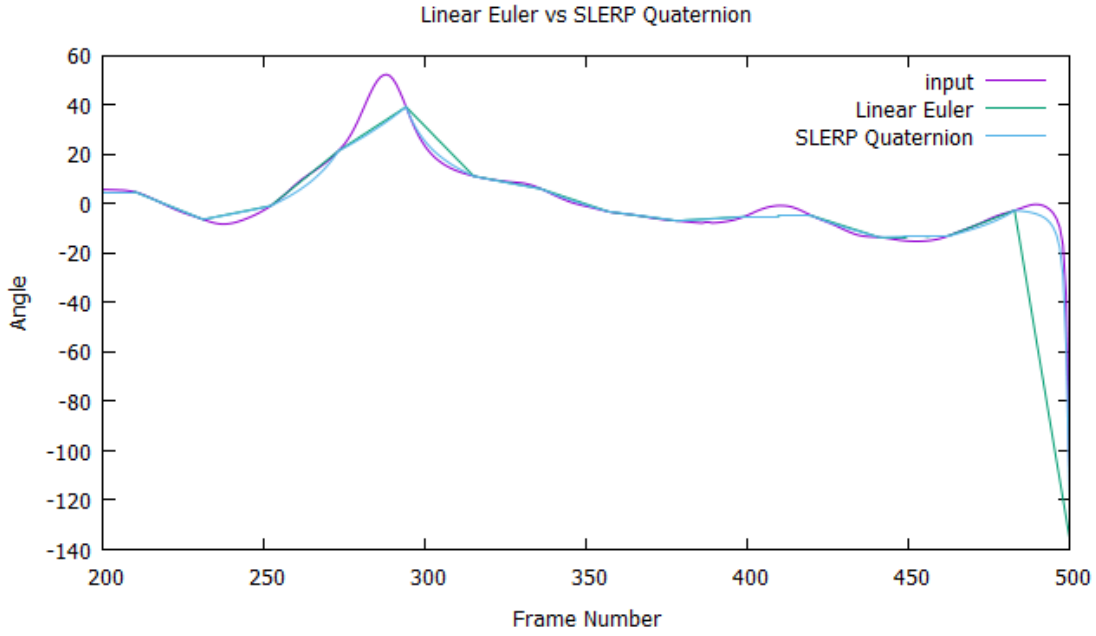
Result Graphs:



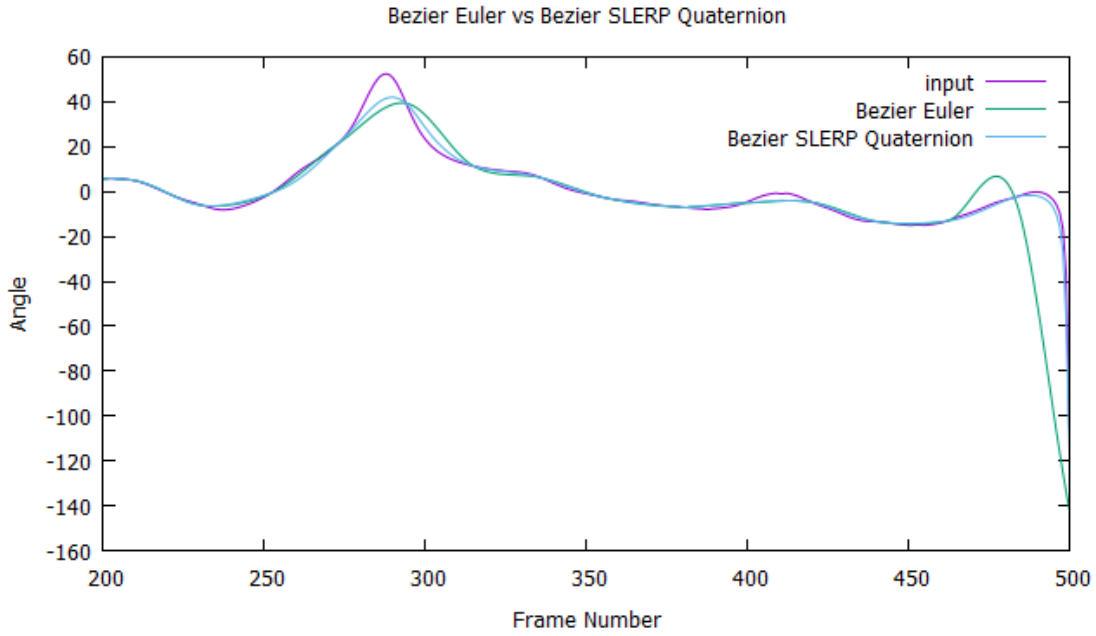
Graph 1 Linear Euler to Bezier Euler interpolation (and input)



Graph 2 SLERP quaternion to Bezier SLERP quaternion interpolation (and input)



Graph 3 Linear Euler to SLERP quaternion (and input)



Graph 3 Bezier Euler to Bezier SLERP quaternion (and input)

Analysis and Observation:

Due to the sample frequency is low (N=20) compares to the changes in input which has rapid change within 20 frames, each result lost some details of the input.
The linear interpolation methods, Linear Euler and SLERP quaternion, drawing a straight line from one key frame to another, taking no account of previous key frame and the next, result into an unsmooth curve that makes the movement robotic and unnatural. Lacking the information of the next key frame also makes the movements in linear interpolation methods look like have delays. While with Bezier methods, both previous and next key frame are taking into account, result into a smooth curve. The movements generated by Bezier methods look much smoother and more nature, but if the movement in input stops, you will see result movement sways a little bit before eventually stops which is even more obvious if it's a rapid stop. This is because of in Bezier method, the previous key frame also effects the interpolation. These can be seen from graph 1 and graph 2.
If we only compare graph 1 and graph 2, it might be hard to see the difference between rotating with Euler and SLERP, but graph 3 and graph 4 give us a clearer view of that. Before the last 50 frames, the difference between Euler and SLERP is quite small, while you can see some tiny delays in graph 4 around frame 300, they are also identical in graph 3. In the last 50 frame, there's a rapid decline in the input, and the results of Euler and SLERP are very different. The results of SLERP follow the input curve quite well, especially with Bezier, while Euler's are not. Since the linear SLERP does follow the curve, the dramatic drop of Euler's cannot be caused by low sample rate. What makes it even worse is that in Bezier Euler, not only it drops, but also it comes with a weird peak. This makes the result movement of Bezier Euler's result very unnatural. I assume the reason of this is because of the gimbal lock problem of Euler angle rotation, which makes the rotation incontinuous.

Extra feature:

I guess going to GDC wouldn't count.