### **Apply standard PCA on coefficients of basis functions without scaling the rootposition**

Methodology: concatenating coefficients of each dimension as a long vector for one motion sample, convert fpca as a standard multivariable PCA.

Test data: walk\_leftStance, 620 samples; and 47 frames, 79 (19 quaternions with four dimensions and one root vector with 3 dimensions) dimensions for each sample

Test variable: number of principal components

Evaluation: mean square error between original coefficients and back projected coefficients

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| --- | --- | --- |
| Maintain of information | Number of principal components | MSE per coefficient |
| 80% | 2 | 0.0157383853217 |
| 85% | 3 | 0.0128316723315 |
| 90% | 3 | 0.0128316723315 |
| 95% | 5 | 0.00805892782304 |
| 97% | 6 | 0.00667670169938 |
| 98% | 7 | 0.00496495874592 |
| 99% | 9 | 0.00358207508069 |

### **Apply standard PCA on coefficients of basis functions with scaling the rootposition**

The root positions where scaled as follow: For all frames in all left stances, calculate the biggest absolute value for x, y and z.

Divide all root positions by the corresponding max value (max\_x for x etc.). The positions are than scaled in range [-1, 1] which is comparable to quaternions I think.

|  |  |  |
| --- | --- | --- |
| Maintain of information | Number of principal components | MSE per coefficient |
| 90% | 4 | 0.000646657525908 |
| 95% | 7 | 0.000485187888874 |
| 97% | 10 | 0.000401674401805 |
| 98% | 15 | 0.000327340050049 |
| 99% | 26 | 0.000234453688103 |

As you can see, the number of PC’s increase. However I think it’s still better than with Cartesian space and keeping 95% of information, we will need 7 dimensions.