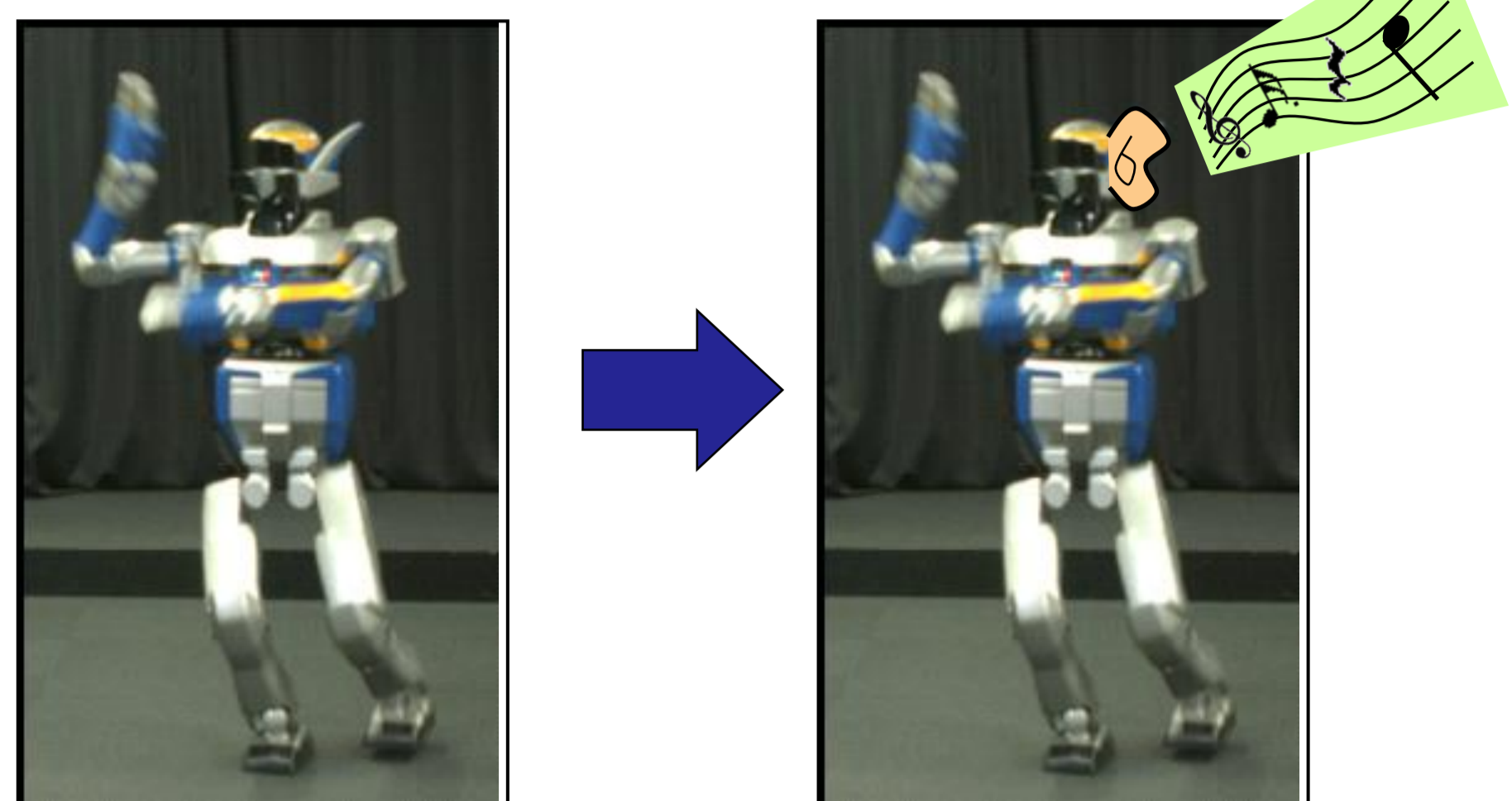


# Temporal Scaling of Upper Body Motion for Sound Feedback System of a Dancing Humanoid Robot

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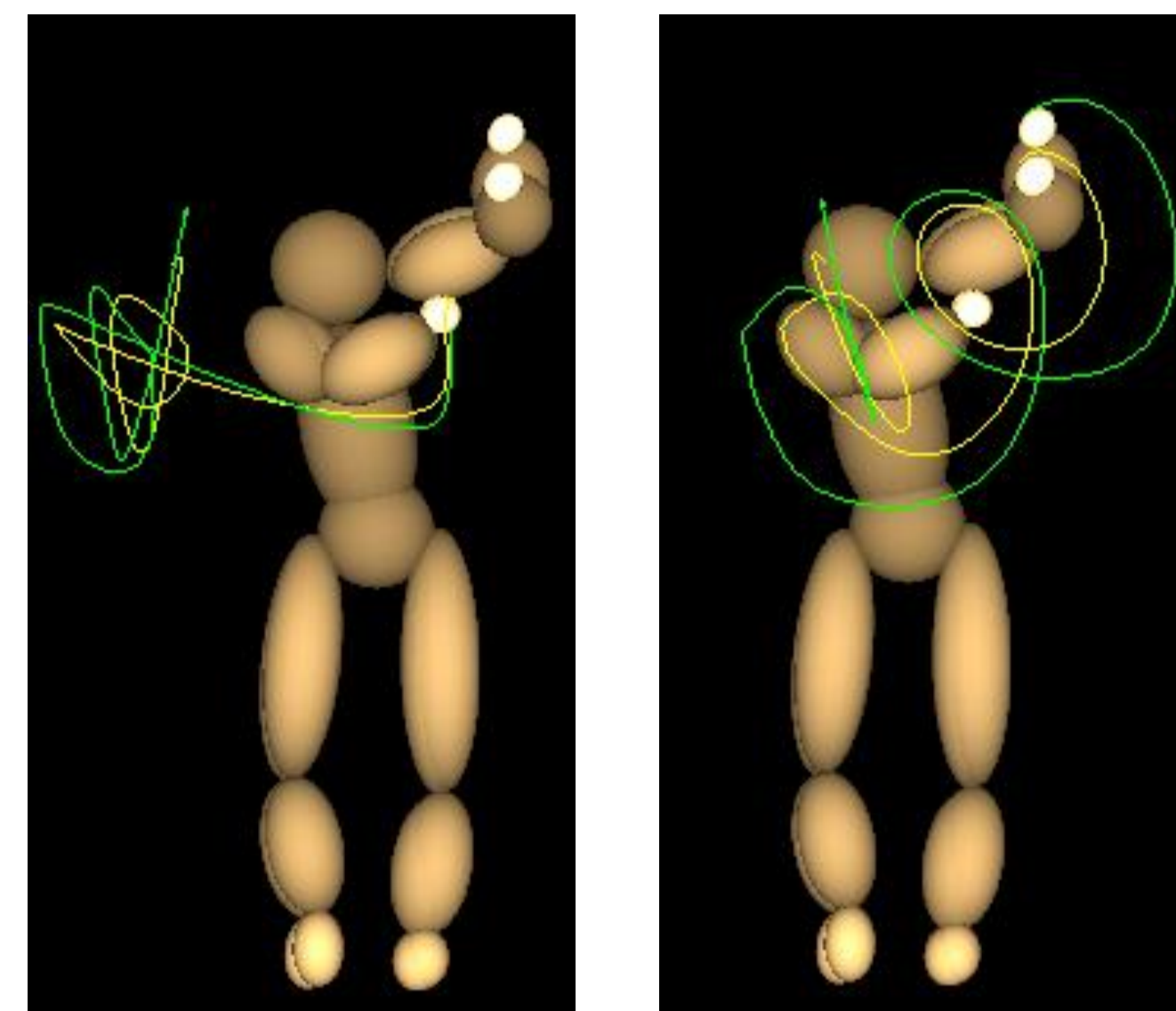
## → Goal

A Dancing-to-Music ability for CG characters & humanoids



*Motion Rhythm* should be synchronized with *Musical Rhythm*.

## → Difference of Motion Details

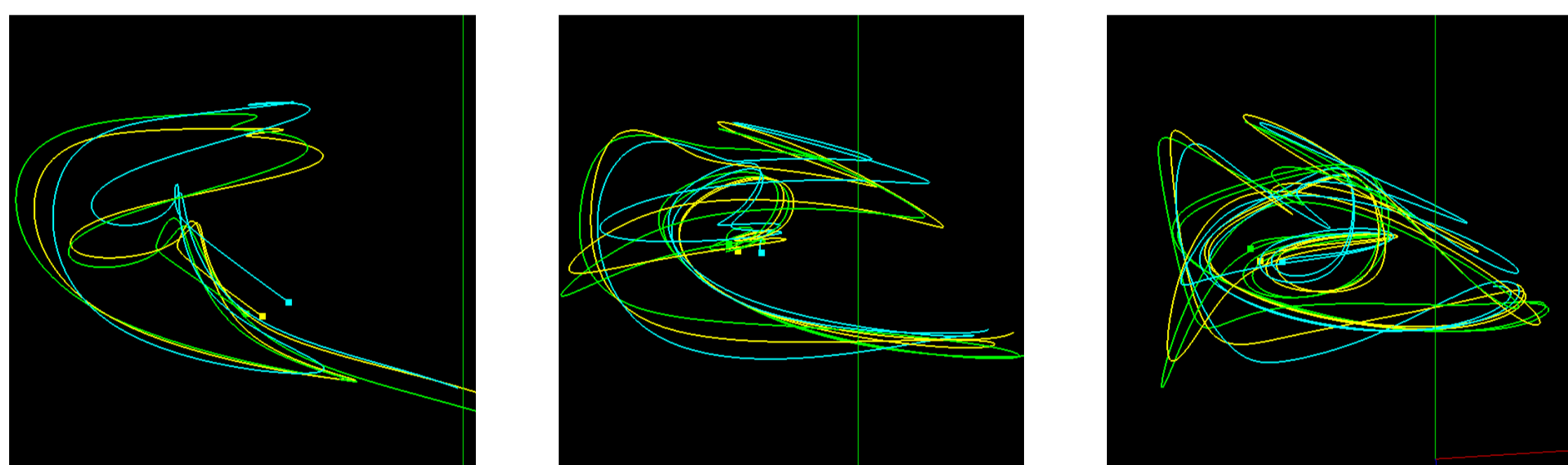


Green: Dance performance at normal musical speed  
 Yellow: Dance performance at 1.3 times faster musical speed

Observation in Frequency Domain  
 Using Hierarchical B-Spline

## → Insights through Observation

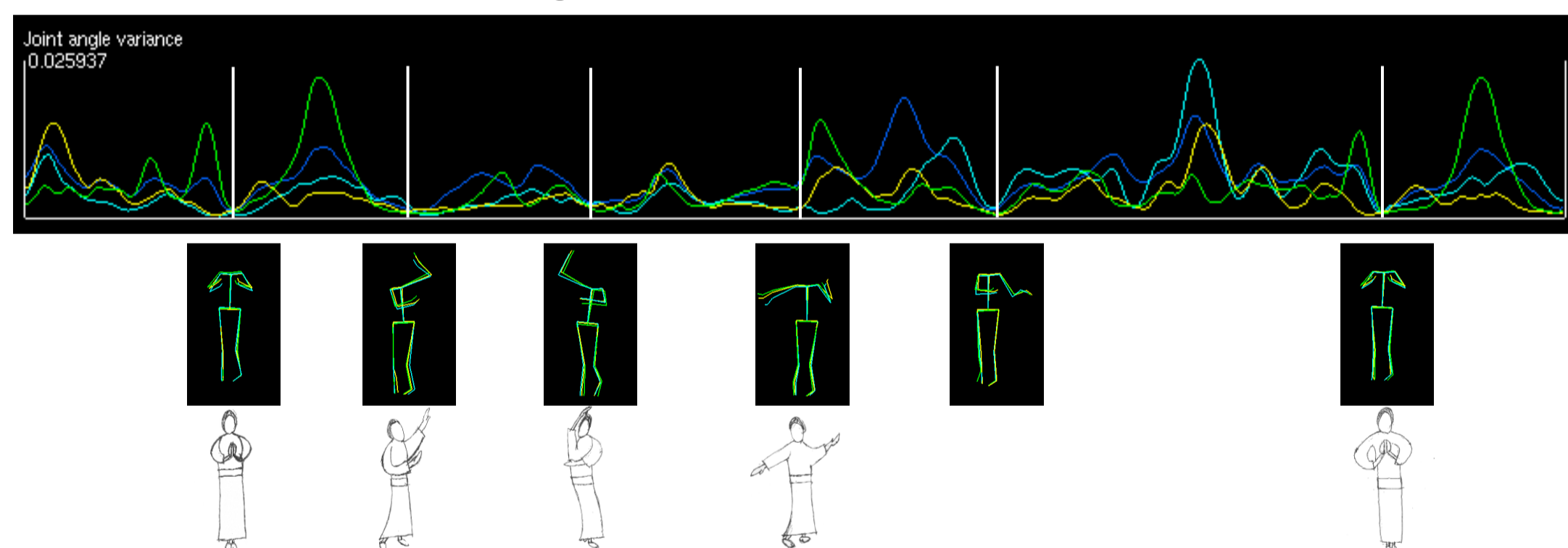
• Mean Joint Angle



Single layer 2 layers 3 layers

High frequency components are gradually attenuated depending on the musical speed.

• Variance of Joint Angle

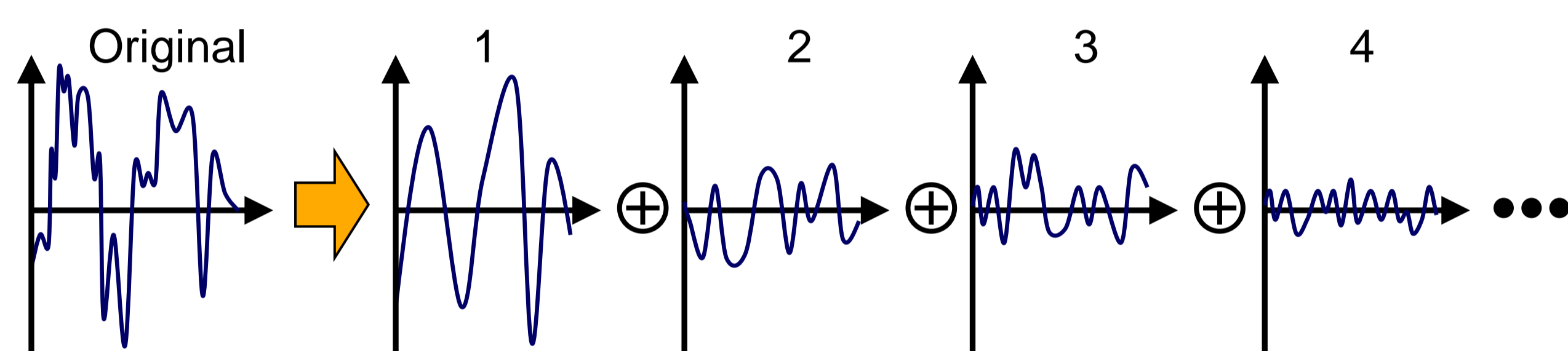


Important stop motions are preserved even when high frequency components are attenuated.

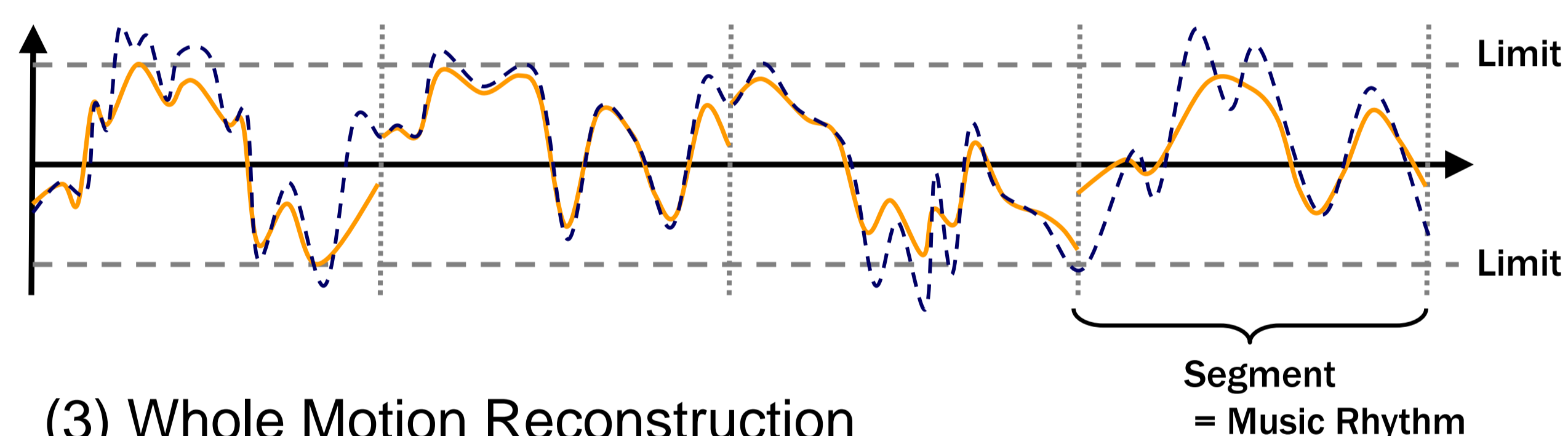
(Green: Normal speed Yellow: 1.2 times faster Light blue: 1.5 times faster Blue: All)

## → Algorithm

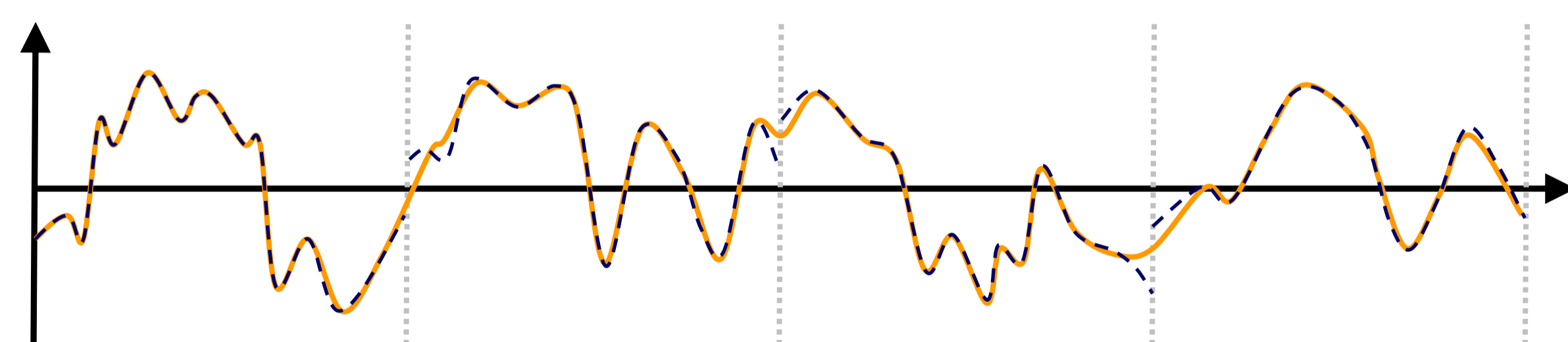
(1) Motion Decomposition Using Hierarchical B-Spline



(2) Parameter Optimization for Each Segment



(3) Whole Motion Reconstruction



## → Results

Simulation Result of Generating 1.2 times faster motion

