

SCORE LEVEL TIMBRE TRANSFORMATIONS OF VIOLIN SOUNDS

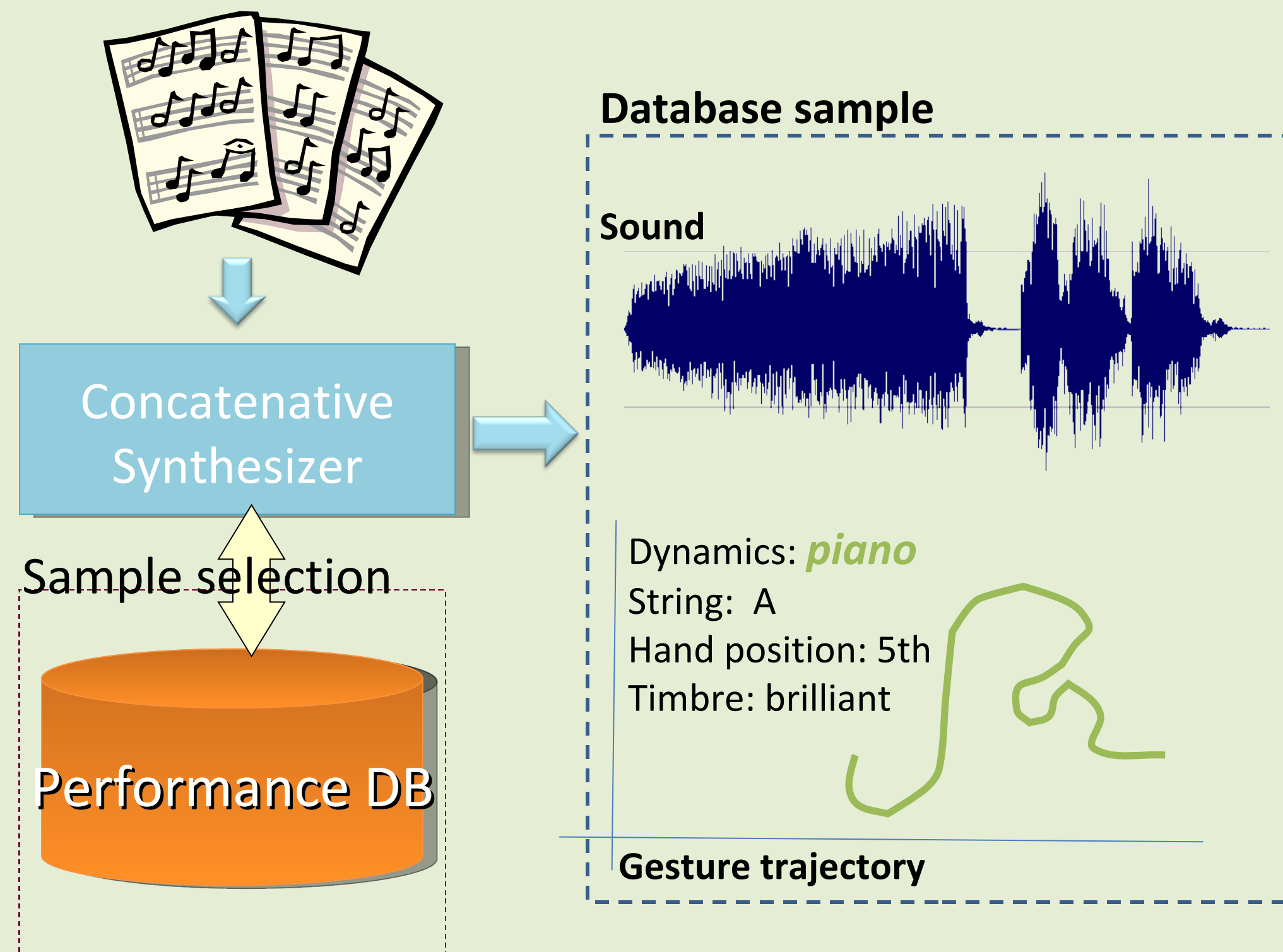
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A performance database of synchronized audio, performance controls and musical score is built. By means of statistical analysis, we are able to model the interrelations among sound (timbre), controls (bow velocity, bow position, etc.) and musical score indications (dynamics, fingering, etc.). In this work we present a procedure for score-controlled timbre transformations of violin sounds within a sample based synthesizer..

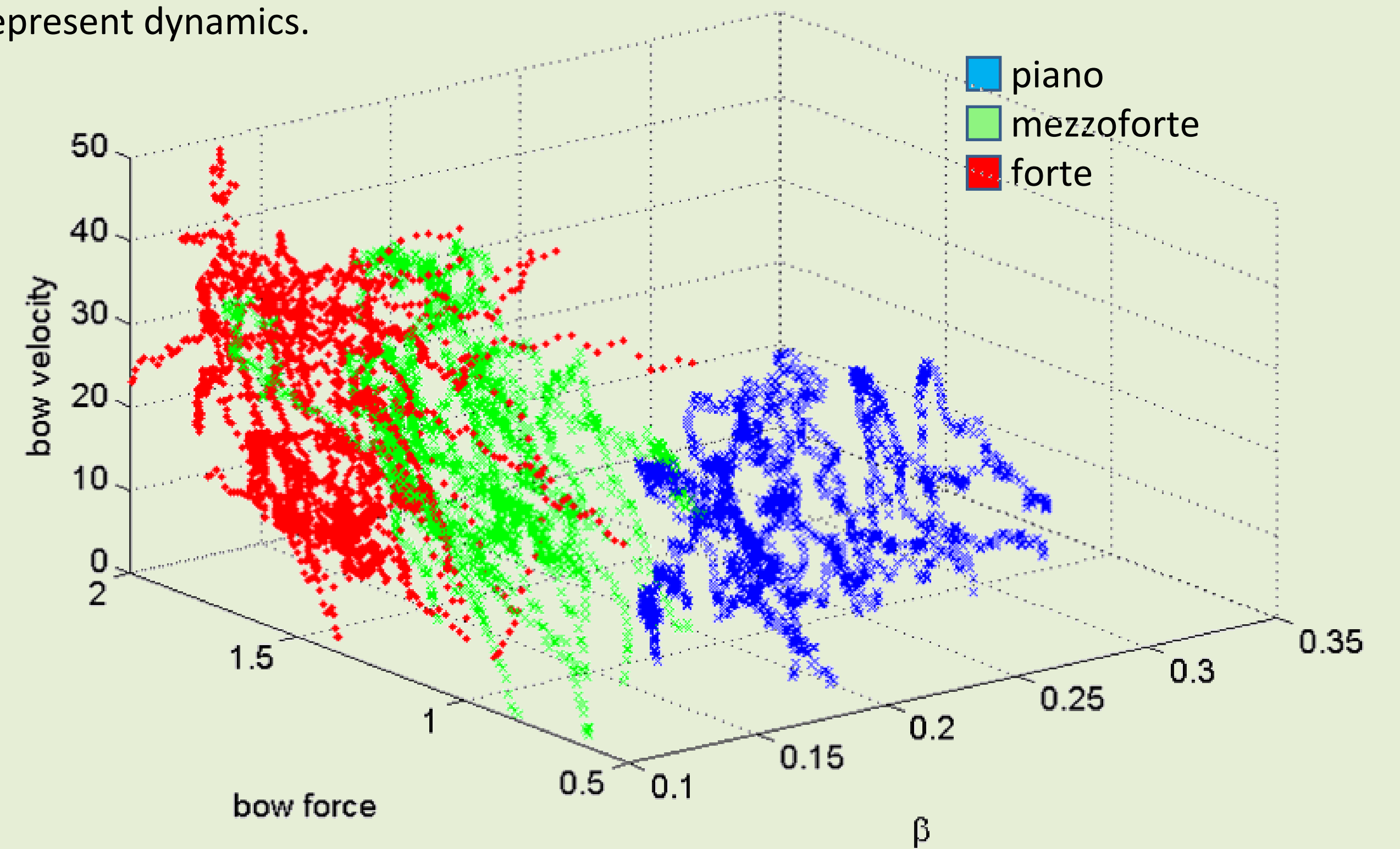
I Sample Retrieval: Sound + Gesture trajectory

A sample based concatenative synthesizer produces a sound that matches in time and pitch a musical score, as well as the controls trajectory with which that sound was played.



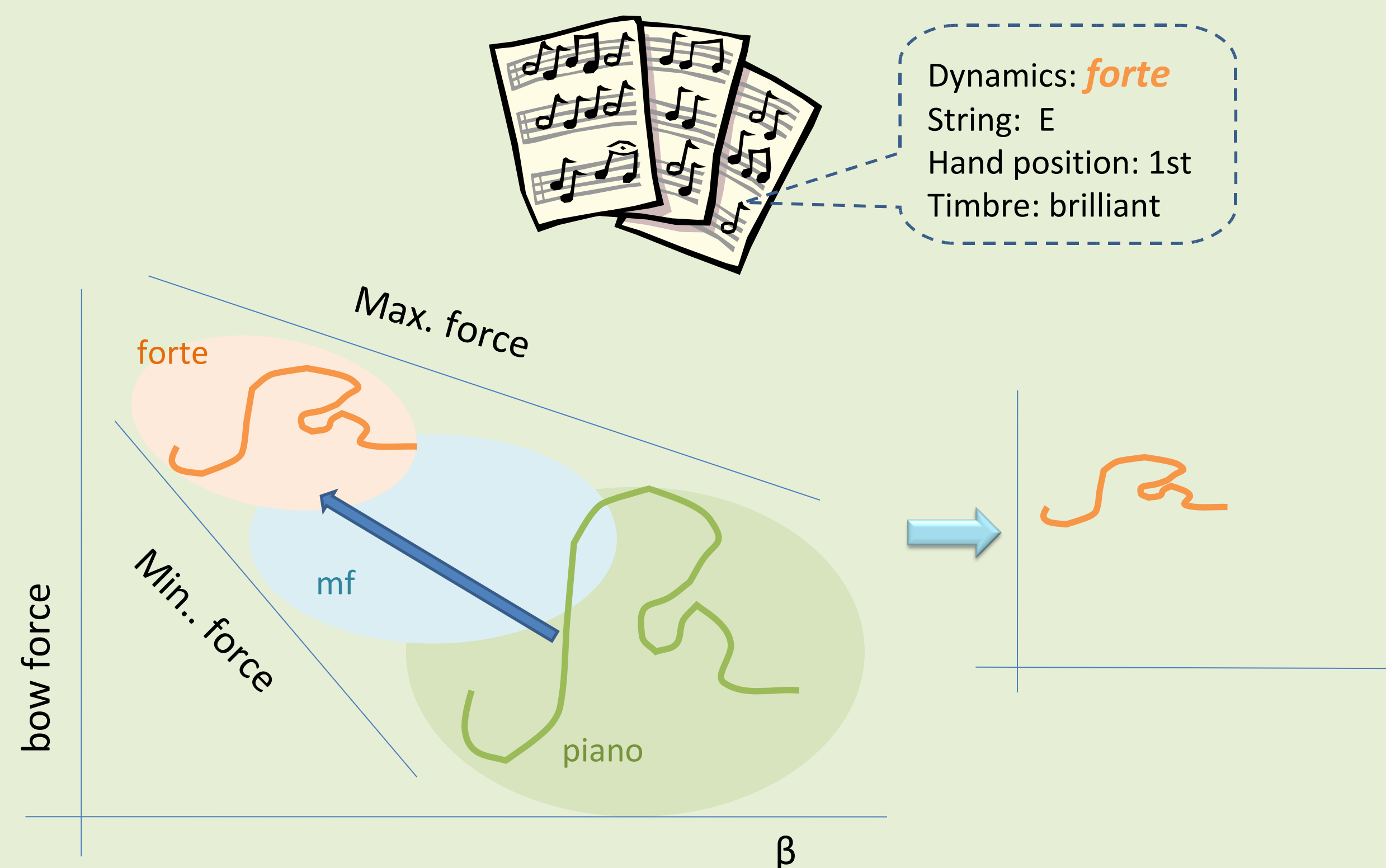
II Control parameter space

From the samples in the database we obtain a n-dimensional control space for each string. In the figure we depict a 3D control space for A string and control parameters *bow force*, *bow velocity* and β (relative bow-bridge distance). Colors represent dynamics.



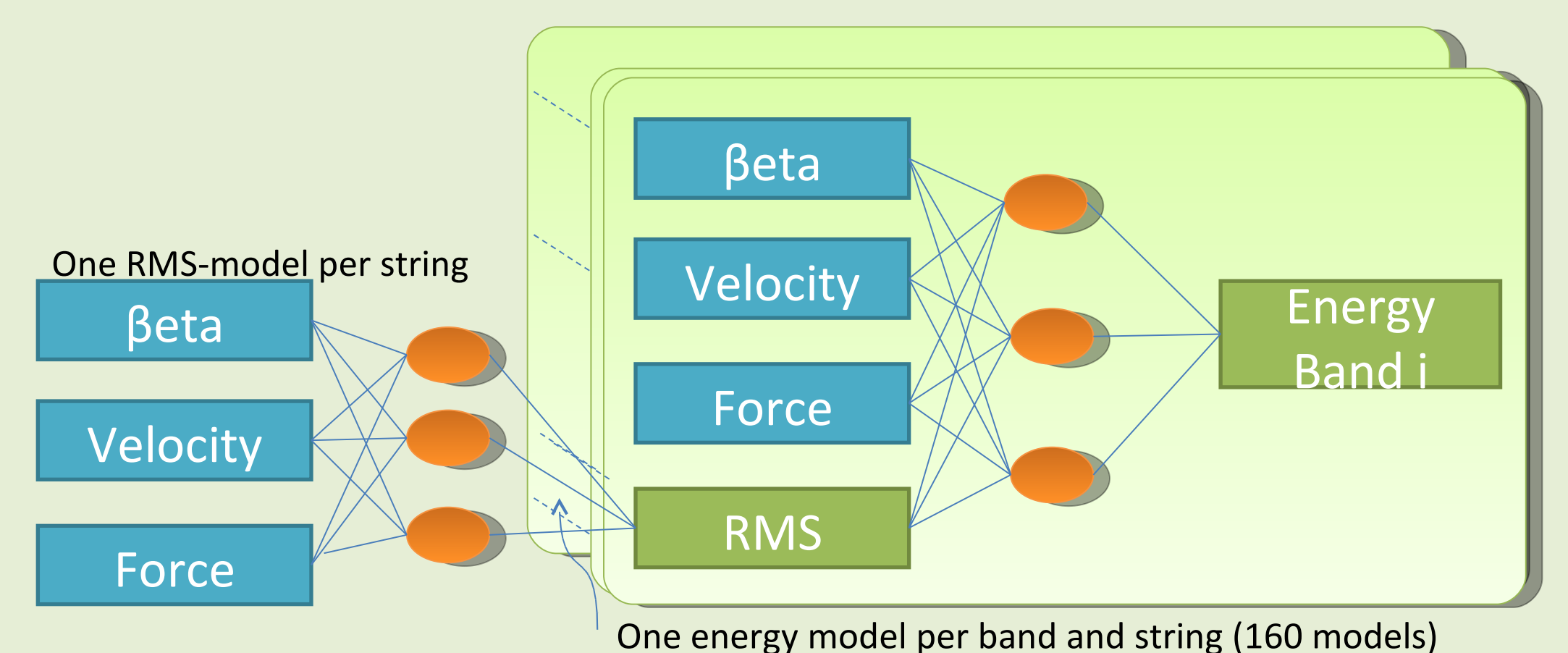
III Gesture trajectory adaptation

The musical score may have indications about how the excerpt should be played: Dynamics, fingering, string, timbre (brilliant, soft): If they differ from the actual indications of the sample, they have to be transformed to fit in the new space region.

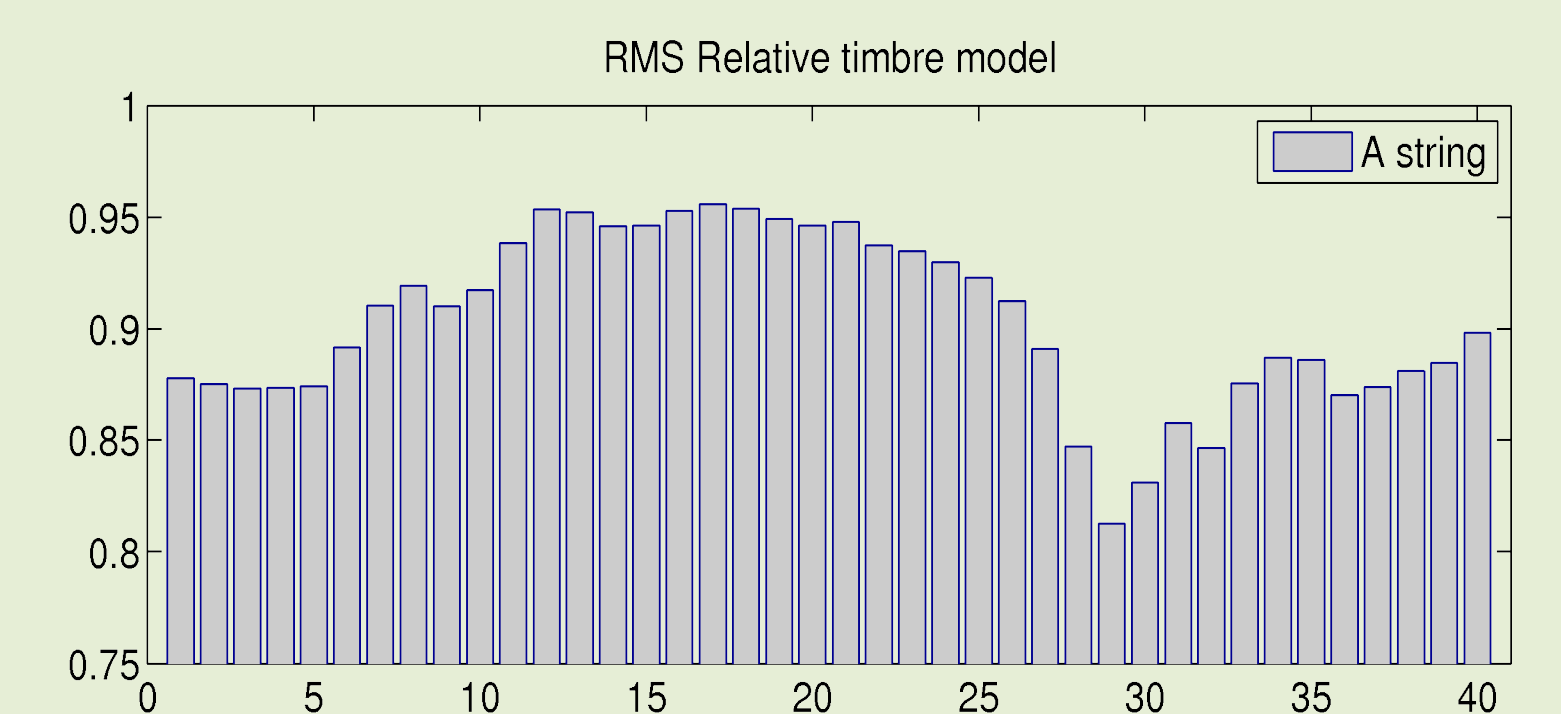


IV Timbre model

Neural networks are trained with the samples in the database to predict timbre envelopes given control parameters. Timbre is represented as the energy at 40 overlapping frequency bands in a logarithmic scale. The diagram represents the architecture of the networks.

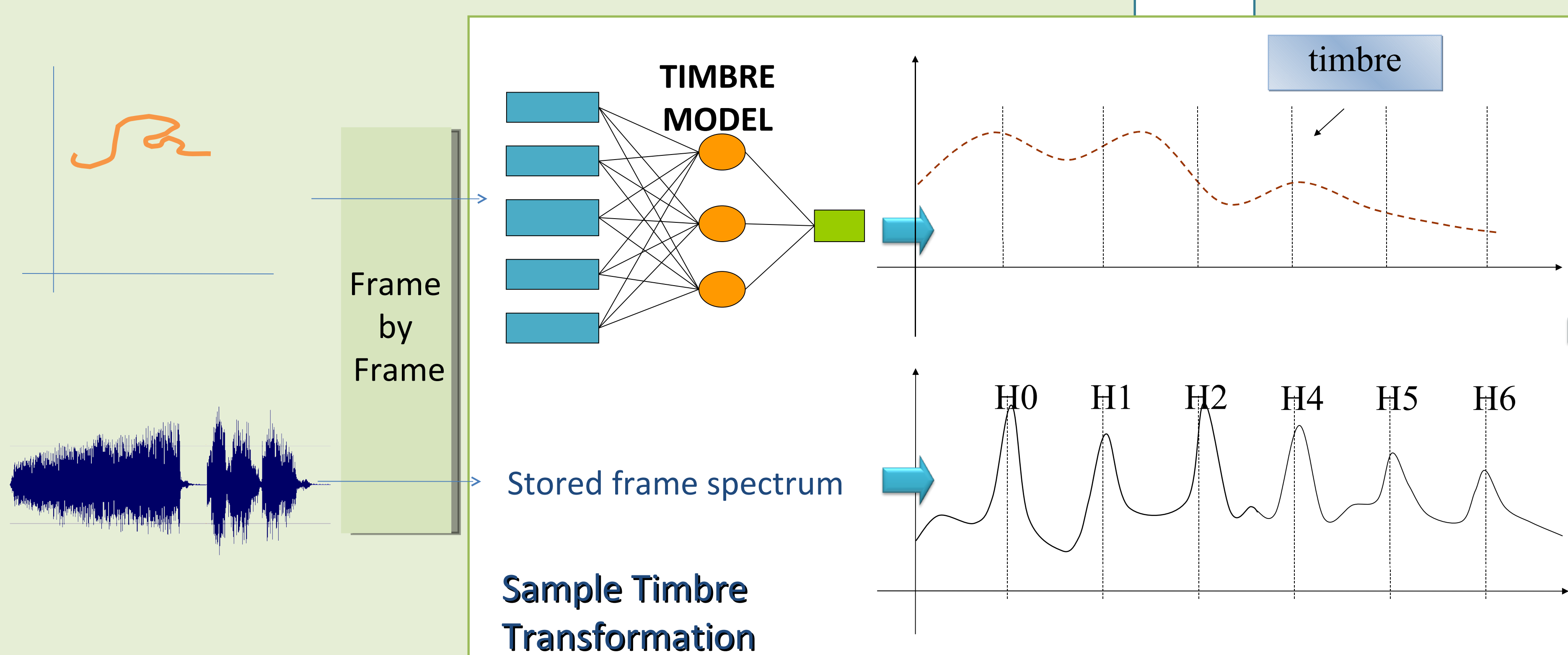


Prediction performance of the model for A-string: correlation coefficient of each band for a 10-fold cross validation.



V Timbre Prediction

From the adapted gesture trajectory, a timbre envelope is predicted for each frame. At the same time the spectrum from the database sample is obtained.



VI Obtain and apply time varying filter

Timbre prediction along time is used as a time varying filter, applied to the retrieved sample. This way we obtain a sound similar as the one in the database but sounding as if it was played following the indications in the score.

