

EXPLORING THE DECAY PROPERTIES OF GUITAR SOUNDS FROM MOBILITY MEASUREMENTS

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ABSTRACT

With the goal of providing the instrument maker useful and fast numerical tools to characterize the final objects, we herein propose a processing system to evaluate the decaying properties of guitars with only a few impact measurements. Our method relies on a hybrid synthesis technique first developed by J. Woodhouse (Acta Acustica, 2004). This technique is able to derive synthetic signals of guitar plucks with a very light computational load and makes use of mobility measurement at the bridge. The obtained signal thus includes the complexity and the singularity of the mechanical and acoustical behavior of the guitar body, without having to estimate or model it. In preceding studies (B. David, ISMA, 2014), some preliminary results have been obtained. It was in particular shown that with only a one-dimensional measurement of the mobility it was possible to well represent the decay properties for all the notes of a specific string. This paper extends those results by dealing with different instruments, by comparing the accuracy of the prediction for several strings and by using 2-dimensional measurements of the mobility. The decaying properties are studied with the help of High Resolution (ESPRIT) method and are “summarized” with the help of the Energy Decay Curve feature. This leads to a representation of the whole guitar compass with a so-called decay profile, which allows us to assess at once the properties of the instrument, its timbre homogeneity in terms of extinction and eventually detect and objectivize possible defects like the well known “dead tones”.