



Modelling of Gabonese harps *

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Abstract

Traditional instruments handed down from generation to generation, Gabonese harps have various shapes, often anthropomorphic, that depending on the population and the region concerned. Nevertheless, harps are all composed of eight strings, each wrapped up on one side to a tuning peg fixed on the neck and at the other side linked to a wooden tailpiece. It is often nailed to both ends of the resonance box, under the soundboard made of animal skin. In order to study the evolution of these instruments within the framework of a multidisciplinary project, an acoustic modelling of the instrument is undertaken. The main objective of this modelling is to understand and highlight maker's elements that predominate in their sound. For this purpose, the Udwadia-Kalaba formulation is used to model vibrating systems coupled together by mechanical constraints. In particular, this formulation can take into account geometrical non-linearities of strings induced by their high-amplitude excitation. Model parameters were first extracted from an instrument at our disposal. Then, time-domain simulations were confronted to experimental data. Finally, a parametric study showed that the low string tension and modal behaviour of the tailpiece are of great importance in the characteristic sound of the instrument.

Keywords: Physical Modelling, Gabonese harps, Udwadia-Kalaba formulation

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