



**Comparative study on the timbre of occidental and African plucked
string instruments**

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Two main families of instrument classification methods have been developed so far. On one side, the oldest one is the classical organology (Tranchefort, 1980), and aims to define the main classes of instrument based on their sound production mode. On the other side, computing sciences have developed Machine learning dedicated to music, called Music Information Retrieval (MIR) (Klapuri, 2004; Herrera-Boyer et al., 2006). MIR is the interdisciplinary science of retrieving any meaningful information from music, which can be whether learned first (i.e. supervised classification), or discovered without any a priori knowledge (i.e. unsupervised classification). Within these two approaches, the timbral complexity of ethnic music instrument raise major problems, making difficult the definition of instrument classes and their automatic recognition. In this study, we performed an acoustic characterization of the timbre of various plucked string instruments of Africa, with the goal of quantifying the timbral complexity within this instrument family. As a first step, a complete set of acoustic descriptors is used project to project the timbral signature of each instrument in a multidimensional space integrating many physical components of the timbre (e.g. temporal profile, spectral content). Then, methods to reduce the dimensionality of this representation space have been used to conserve only dimensions optimizing the certain criteria, such as the inter-class discrimination. As a second step of analysis, unsupervised analysis of data visualisation/structuration (e.g. clustering) have been used to quantify the dispersion of the acoustic timbre. A complexity measure of the timbre has been derived from this dispersion. This study presents an inter-note / inter-instrument / inter-cultural (ethnic / occident) comparative results.