Guitar Type Classification

https://github.com/sergionimar/MIR-Project_SergioNieves

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This project involves the development of a software that can distinguish between recordings of songs that are played with an acoustic guitar or with an electric guitar. To do this I have used the IDMT-SMT-GUITAR database, which can be found at the following link: https://www.idmt.fraunhofer.de/en/business_units/m2d/smt/guitar.html. Concretely I have used the fourth dataset of which the database is composed, which contains a great number of songs recorded by 3 guitars (two electric and one acoustic played in two different ways) and which is divided inside each guitar by the speed of the song and by the musical genre.

To create the software, I have based myself on two papers, which have helped me choose the machine learning model to use and the features necessary to classify these two types of guitars. The papers are the following ones:

- Johnson, D., & Tzanetakis, G. (2015). Guitar model recognition from single instrument audio recordings. *IEEE Pacific RIM Conference on Communications, Computers, and Signal Processing - Proceedings*, *2015–Novem*, 370–375.
- Fuhrmann, F. (2012). Automatic musical instrument recognition from polyphonic music audio signals.

For the creation and evaluation of the Support Vector Machine algorithm I have used the sklearn python library, and for obtaining the sound features of the recordings, the Essentia library developed by the MTG.

The objective of this project is basically to find the right way to train the machine learning model so that it works with the greatest possible accuracy. To do this I have been exploring several ways to group the files available for both training and testing. The maximum precision that I have been able to obtain at the moment is 69.3%. This data is not very good, considering that we only have two possible results, acoustic or electric. This value has been achieved by splitting each file into frames of a second and extracting from each of them the features that are supposed to be most relevant to distinguish between the two types of guitar. The features used have been MFCC, energy in Bark Bands and the 0th spectral valley coefficient. To train the model I have used both the fast and slow versions of the songs of each guitar of the genres classic, jazz, pop and metal. To test the algorithm, I used the rest of the recordings, corresponding to reggae_ska, country_folk, rock_blues and latin. The results of the evaluation are the following:

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Accuracy of the model:  0.693103951013 %

Confusion matrix:
Acoustic Electric
  1563     2046    Acoustic
  59       3191    Electric
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As we can see in the confusion matrix, a large part of the acoustic guitars are classified as electric, but almost all electric guitars are well classified. This is the main error to correct, we need to add some feature or data to help characterize more the acoustic guitars.