LickNet: Software Tools Collection for Guitar Licks Networks

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Abstract.

1 Introduction

Musicians are often intrigued on how other musicians compose or improvise their music and if there are some relations with their previous composed music or with the compositions of other musicians. Even non expert music enthusiasts often wonder what makes a musician unique, well recognisable between the others, or what makes a musician so similar to another. For example this frequently happens with guitarists, when people recognize a "Santana" guitar solo or a "Hendrix" guitar solo just listening few notes and having never heard that particular solo, or when people says that Steve Vai sounds similar to Joe Satriani.[1]. One may think that this behaviour is caused by the fact that there are some notes patterns repetition in one musician compositions history or that there are some similar notes patterns between different musicians compositions caused by their similar musical influence or musical tastes.

Thus with the aim to analyze the relations between notes patterns in guitar solos, often called guitar licks, the developing process of the software described in this document, *LickNet*, has been started. The choose of guitar solos has been taken because of the large amount of data available online but the subject may be extended to different, but similar, kind of data. For example drum patterns relations in jam sessions or other instruments executions, compositions and improvisations may be considered. It has been chosen to represent the data elements and their relations within a network, as to the means offered by the graph theory useful for a mathematical analysis.

The area of scientific research that usually is interested in the empirical examination of real-world network is the study of *Complex Networks*. Some of the study approaches and mathematical methods that usually interests the Complex Networks area, such as graph theory or scale-free network comparison[1], have been considered and will be discussed in the next sections.

In addition to the network analysis tools, LickNet provides some other features

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[1] Last.fm, a collaborative website, assigns a "super" level of similarity between Steve Vai and Joe Satriani. This may be related to the fact that Steve Vai was a his student.

focused more on the non-technical use of the application, like the *Lick Classifier* and the *Lick Generator*. These functionalities are still in an early stage but can be a starting point to realize some practical application focused to end users who may want to understand and replicate some other guitarist playing style, or to realize some artificial agents that may "play" some music while interacting with human players.

2 Complex Networks

2.1 Related Works

3 LickNet

As introduced before, LickNet offers the possibility to study the relations between notes patterns in guitar solos through the creation and analysis of guitar licks networks. Moreover it collects some software tools with which is possible to do some particular operations with guitar licks through the use of the created networks. These operations are currently two, a classifier and a generator of guitar licks.
Before getting into the software components, the next section is going to focus on how the interested data are collected, structured and processed.

4 Data

As many guitarists may already know, there are plenty of websites that store guitar sheet music files. One of them is `www.ultimate-guitar.com` that counts more than 800000 sheet music files, which are mostly written with the guitar tablature notation. Guitar players usually choose this notation for its ease of use [2] but it is instrument-specific. Also guitar tablature is not standardized and different sheet-music publishers adopt different conventions. This means that a guitar tablature can be understood only by guitar players and its conversion to the standard notation or formal interpretation may result wearing. For example the semantic of a guitar tablature changes even if a guitar it is not standard tuned.
Fortunately there are various computer programs available for writing tablature. One of most frequently used is *Guitar Pro* and the *Ultimate Guitar* servers store a large amount of tablature files encoded with its format. Another interesting software is *TuxGuitar*, a free and open source tablature editor that also supports the ability to import and export Guitar Pro files[2]. Moreover its source code can be freely re-used and adapted to any other application as it has been done with LickNet with the purpose of importing the tablature files retrieved online. After that the tablature can be interpreted by software, a guitar solo is represented as a sequence of notes, where each of them is composed of:

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[2] Guitar tablature removes the requirement for the player to remember the associations between the notes and the corresponding fretboard positions, as the latter are directly represented in the tablature notation.

- string ..
- value ..

5 Networks Generator

5.1 Complex Networks Analysis

6 Lick Classifier

6.1 Tests and Results

7 Licks Generator

7.1 Tests and Results

8 Development Complications

9 Future Development

10 Conclusions

References

1. Maarteen van Steen, *Graph Theory and Complex Networks: An Introduction*, 2010.
2. Daniel Mantilla, TuxGuitar: Editorial review, *Software Informer*, 2014.