PROJECT PROPOSAL: MELODIC ANALYSIS OF RAGTIME MUSIC

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1. TOPIC AND MOTIVATION

1.1 Introduction

Finding the distinct characteristic of different music genres is an important first step for music genre classification. Using computational methods to investigate the underlying characteristic of certain genre can contribute to both Music Information Retrieval (MIR) and Musicology. For musicologist, computational researches provide a solid foundation to confirm musicological hypothesis about certain genre, or even sometimes offer new insights. On the other hand, for MIR researchers, it helps to accordingly select or design features for classification, which may be more effective and interpretable than feeding every possible feature into a classification model.

The focus of this research is to explore the melodic properties of ragtime music by statistical analysis. Ragtime is a musical style that flourished from the mid-1890s to 1918. Its main identifying trait is the syncopated rhythm, and previous studies thus focus on its rhythmic features. To our best knowledge, there is no previous work studying the melodic features, but these features may also offer fresh insights into ragtime music or serve as discriminative descriptors for classification and retrieval. Further potential application includes composing music with ragtime traits as in [6].

We follow Volk's work in [1, 2] to conduct a corpus-based study with a subset of the RAG-collection, which consists of around 2600 MIDI files of unique ragtime pieces coming from various composers and ages. jSymbolic is used for extracting symbolic melodic features and statistical analysis of these features is applied to explore the melodic properties of ragtime music. Finally, we utilize gradient boosting (in particular, XGBoost) to investigate what melodic features can better help to classify different subgroups of ragtime music (such as early vs. late) and the effectiveness of these features.

1.2 Related Work

There have been a series of work studying the rhythmic characteristics of ragtime music with computational methods [1, 2]. Some research was conducted to use the characteristics to compare it to other styles of music as in [3]. These works demonstrated the potential of conducting statistical analysis on the RAG-C. They verified several musicologic hypothesis and provided insights to the usage of rhythmic patterns in ragtime music. Throughout these work, the rhythmic features have been studied quite well and it may be time to incorporate other aspects such as the melody of ragtime music to develop further understanding.

2. RESEARCH QUESTION

The research question we try to answer in our research is twofold. The first part tries to explore the idiomatic motifs regarding melodic characteristics of ragtime music. Second, if these features are discriminative for classifying ragtime music in certain subgroups.

We are interested in determining if ragtime music not only has characteristic features in the syncopation patterns as shown in [1,2], but also in certain melodic patterns. The idiomatic motifs will be investigated on the basis of the features extracted by jSymbolic. This may be useful for classifying the sub genre, the composers, or the era of ragtime music

3. METHOD

To answer the research question, we are going to use the MIDI files from the previously described ragtime music collection. Firstly, some preprocessing need to be done. Only the melody is considered for the research so this needs to be extracted. We are provided with songs where this processing is already done. If this isn't the case we could extract these melodies our self. Some research is done on this subject as can be seen in [4, 5], but this is a subject on it's own. Due to the time constraints and the limited scope of the project we won't be able to do this. We describe this further in Section 5.

For now we presume that we get the separated melody files. This needs to be converted to MIDI files to be used with jSymbolic. jSymbolic will provide us with features. These features is the data that will be analyzed. If there are certain melodic characteristics it's combined with the META data of the RAG-collection and compared with the finding in [1, 2] to see if there is a correlation between the time when the song was produced and the characteristics that are extracted.

3.1 Features

To find the features of the music we are going to use jSymbolic. jSymbolic is an open-source software application for extracting statistical information from musical data stored in MIDI files. It has a lot of different features. We will ignore the features based on rhythm because some extensive research has already be done on this subject by Volk et al. At first, our research will mainly focus on the features based on melodic interval. It's hard to tell beforehand which features will be important. Data analysis will likely show some more interesting features on which we will narrow our research down.

3.2 Exploratory Data analysis

We will first look into the distribution (such as histogram or scatter plot) and statistical information (such as mean and variance) of each extracted feature and see if there are any interesting interpretations we can come out with. Then, to dig deeper into these features, we can further check the reasons or development of the patterns we find. This may involve observations on the original data and comparison between different subgroups of ragtime music. For example, if we find a certain melodic interval is common, then what is the complete context of it?

3.3 Classification

We plan to perform the classification by XGBoost, an open-source library for gradient boosting algorithm. It is a popular choice as it has been proven to be efficient and effective in many classification tasks. Surely there will be some data processing involved in this step, such as normalization and data cleaning. Through XGBoost, we can measure the feature importance for each classification task. It will be an iterative process to select features and conduct the classification to improve the performance and better analyze the features.

4. EXPECTED RESULTS

We think that there will be patterns in the melody of ragtime music. We have quite a large-scale dataset and jSymbolic provides a lot of features, which means that there is a big potential for finding some interesting patterns. It is hard to tell whether these findings are not discriminative for classifying different subgroups of ragtime music now, but at least some insights can be provided.

5. PLANNING

For the planning see 1.

5.1 Contingency plan

A big part of the research is focussed on the melody of ragtime music. So a first step is to make sure we have the melodies separated. If this isn't the case then it's not feasible to extract that ourselves and perform a research as well. To make sure that we aren't stuck for too long, we will continue the research under a different research question. The research will focus more on the pitch of ragtime music. This is still close to melody, as melody can be seen as the interval between consecutive pitches. The research question we then try to answer is still twofold. The first part tries to explore if there are discriminative characteristics regarding the pitch of ragtime music. Second, if these features exist, do they subcategorize ragtime music.

The use of jSymbolic shouldn't be a big risk, because the usage of it seems quite understandable and in the lecture of 06-12-18 by Iris Yuping Ren it was said to be an easy to use tool.

Week	Planning
50	Discuss project Proposal Maybe alter planning Do the tutorial on jSymbolic Get the needed subset of RAG-Collection Examine the Ragtime music collection
51	Run first jSymbolic test on the Ragtime dataset Examine results and determine most interesting features Start exploratory data analysis
52	Holiday so no work can be done
1	Finish exploratory data analysis Get familiar with XGBoost
2	Finish the classification and the evaluation Start writing the project report
3	Write most of the project report Prepare the presentation Some buffer if things don't go as planned
4	Present the project Finish the project report Close the project

Table 1. Week by week planning for the project

6. REFERENCES

[1] A. Volk and W.B. de Haas "A Corpus-Based study on ragtime syncopation," *Proceedings of the 14th International Society for Music Information Retrieval Conference* (ISMIR), 2013, Curitiba, Brazil.

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[3] D. Odekerken, A. Volk and H. V. Koops "Rhythmic patterns in ragtime and jazz," *Proceedings of the 7th International Workshop on Folk Music Analysis*, 44-49, 2017, Málaga, Spain.

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[6] J. Michelson, H. Xu and P. B. Kirlin “Probabilistic Generation of Ragtime Music from Classical Melodies” *Mathematics and Computation in Music*, pp 350-360, 2017.