A study of musical structure analysis focussing on tacit musical knowledge

Sanya Moriyama

School of Knowledge Science,
Japan Advanced Institute of Science and Technology

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Introduction

A music performer learns musical tacit knowledge empirically. We do not understand how a performer acquire musical tacit knowledge. It has however been said that musical structure plays an important role when a performer makes interpretation of music.

Music has various musical structure such as polyphony, homophony and monophony. This research focusses on the polyphony structure with these structure. Polyphony consists of several different parts. The structure is so skillfully organized and well-polished and reminds us of a baroque architecture. The structure should therefore have some musical knowledge. We aim to clarify the structure.

This research focusses on computational part-separation of polyphony, that is one of the issue of musical structure.

Formal understanding of musical structure will contribute to various fields such as musical education and automatic computer performance

We grapple with the problem of part-separation in order to understand the multiple structure of polyphony.

The problem about how to listen

Each people has his/her way of listening. We are interested in exploring the special tacit music knowledge which is included in classical music. This knowledge is beyond mere entertainment and gives us great experiences. This knowledge is actually supported by many people's experience. We believe that this knowledge is based on an understanding of the musical structure.

Building a part-separation model

We focussed on a part-separation because separating the part is the first phase of understanding of the polyphony structure. We believe that the part-separation can be an indicator for understanding of polyphony structure. We turn to cognitive psychology in order to establish a model close to the listeners observation.

This research focussed on a melody because a listener may identify the parts using the melody.

We patternize a melody with a contour based on cognitive psychology. We make a pattern from the viewpoint of experience in advance, unity of notes in the sense of a gestalt approach and a memory system. We suppose that naturally features of the works are directly decided by its work because understanding ability of musical structure seems to be available only empirically but not naturally.

Experiment of part-separation

We perform some experiments in forty-eight preludes and fugues book II which was composed by J.S.Bach. We use MIDI data files for each work respectively. We use only note on and note off information. We take basic pattern unit as a 16th note. We take pattern length range from 3 to 16 according to a result of our preliminary experiment. We give the proposed model the separated pattern beforehand. Later, the model tries to separate parts.

Result and Discussion

As a result, prediction accuracy of the proposed model are 94.2%, 92.6%, 97.0% for Fugue I,II,V respectively. Prediction accuracy of the nearby model are 96.0%, 94.8%, 97.8% for Fugue I,II,V respectively. The proposed model achieved better prediction performance than the nearby model for finding subject's motif in the musical structure.

Part-separation prediction accuracy is as good as the nearby model. We understand that this model can separate parts refer to the "subject" and the "answer" using a melody pattern beforehand. This is worth for player to learn the separated parts.

We can say that **both two models** fail to separate parts when the parts contain harmonic motion or can get new melody which is not allowed in a correct melody.

We can say that things which are **difficult in the proposed model** are universality, variation of rhythm and general structure.

Conclusion

The proposed model imitates listeners behavior. Problems in the future are improvements of the proposed model. We make a part-separation model and perform experiments with three works. As a result, We can understand what is good and what is wrong about the proposed model. We also consider it from the view of musicology.

We can say that **difficult issues in the proposed model** are all about modeling. In order to solve

these problems, we model a rhythm pattern which uses note length at the same time. we also model a beat tracking in order to understand global structure and common patterns which are used between works. Furthermore, we will model tonal structure, pattern ambiguity and evaluation method of patterns.

We can say that **difficult issues both found** in the proposed model and the nearby model are about the concepts. For example, harmonic motions are grouped into one which has new function, so we do not always have to separate the parts.

We have many problems needed to be solved. In next generation, we try to express a pattern using a viewpoint of note duration or interval expression awaring tonal. If the model understands more large structure, we will check how and when patterns should be used.