Implementation of Harmony Analysis for Jazz by Using Combinatory Categorial Grammar

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Recently, industrial application of the music information science develops exceedingly. Not only techniques for musicians like automatic music composition/arrangement but techniques that end users receives a benefit like the music information retrieval or the music Recommendation system is drawing an attention.

To provide these techniques, the music theory plays a big role for these technical realization. Reconstruction of traditional music theory to computational music theory has become important recently.

In this paper, I focus on harmony. Harmony is one of the most basic elements in tonal music. Harmony analysis enables to grasp technique of expression in musical piece structurally or functionally and support musical activity engineeringly. Therefore, it is considered that computational harmony analysis enables to support musical activity engineeringly and apply to automatic music transcription.

I also focus on chordal jazz that is played as bebop style because harmony and theory used in this kind of jazz has a great influence on popular music. It is considered that we can analyze functionally more chord progression by adopting this jazz theory into harmony analysis system.

Based on the above, the aim of this research is implementation of harmony analysis for popular music including jazz harmony.

There is previous research that proposed the method of jazz harmony analysis by adopting Combinatory Categorial Grammar(CCG). It assumed that it regards chord progression written in chord name as input and function that represent the role of chord as output. but there are problems that it gives only one function to the chord supposed to have several interpretation and that it gives irrelevant interpretation.

To deal with these problems I replaced chord name for degree name including key information as input and regenerated lexicon to cover the function not handled by previous research like sub dominant minor or secondary dominant. moreover, I improved algorithm to recognize the pivot chord used in one case that two interpretation is realized.

in this paper I assume that input of harmony analysis is chord name. Therefore my proposed method above require key estimation to convert chord name into degree name. I adopt Tonal Pitch Space(TPS) as key estimation before analyzing degree name by CCG. TPS can decide the quantitative distance between two pitches, chords, and keys. it can calculate quantitative distances between chords in different keys. These chords are stable and give us good feelings when the distance is nearer, and are unnatural and give us bad feelings when the distance is further. There is another previous research that adapted non-diatonic chord to TPS. I arranged this method and adopted into my research as key estimation.

I implemented my system with proposed method, and evaluated its validity by experiment.The result of the experiment realize that my system can analyze chord progressions in major key including pivot chords adequately and it can annotation function added by proposed method appropriately. But in terms of chord progressions with modulations caused by factor except for pivot chord or minor key that has three scales, my system leaves much to be desired.

The future work is as follows:

- support for the chord progression depended on melody or modal jazz that has many scales.
- quantitative evaluation with mass score.