

ISE575c paper review (week 10)

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Musical Harmonization with constraints : A survey,
Francois Pachet, Pierre Roy

Some of the synthesizers have a feature about auto harmonization. When the user put a bass line with a melody line (2-voices), then the synthesizer fills in the inner voices (2~3 more to generate full chord), which is easier. I remembered this when I first looked at the title of this paper. I know this is hard when the melody part is the only one played, which has many choices and many rules to calculate.

This survey paper was helpful to solve the problem how to harmonize the given melody with constraints. Tonal music has lots of regulations to add harmonized notes in parallel and many rules to build up the next notes in series. Tonal music has been researched and evolved through the centuries. Basic rules are still valid while complicated rules have been developed after repetitive collapsing and building them. Whereas, atonal music such as serial is also prevail. The author chose tonal music area for collecting various harmonization techniques. Before start, some basic examples of the rules of harmony were shown. Some forbidden rules, for instance, tritone interval in horizontal rules and repetition of 6 chords in vertical rules, were introduced. The parallel 5th rule causes change of chord itself, so a correct answer can choose different tonal progression.

The harmonization problem with the fixed voice can be approached as combinatorial problems. Melody imposed and 3 other voices to be composed and unfigured bass and 3 other voices composed can solve under a combinatorial viewpoint. While, Figured bass can reduce the information space because it contains chord components. Also, two-voice problem is the simplest method to find all chord with a melody and a bass pattern, applying simplified rules into it.

There have been many attempts to find proper modeling the automatic harmonization problem with constraints. Steel, Courtot, and Daniel Levitt use constraints to create passing chords, polynomials, and stylistic accompaniments, respectively. Schottstaedt, Ebcioglu, Ovans & Davidson, Tsang & Aitken, and Philippe Ballesta use fully-fledged constraint satisfaction under various conditions. Ebcioglu is the first person to develop high-quality 4-part music entirely automatically. Tsang & Aitken issued CLP with 20 rules to compose 4 part harmonization. I believed his paper deserves to be a reference because a set of rules is very small compared to others. So far, I wanted to read

their own papers, which contained constraints and rules they actually had used. The most interested papers to read was Ebcioğlu's and Tsang & Aitken's. I love this course because Elaine touched almost every automatic composition papers with good summarized survey papers so that I finally had an impetus to search more.

Although researchers have published many papers so far, I am a little bit disappointed that there is no commercial software package for automatic harmonization. In other words, I still have a chance to develop it! I had been researching some acoustics problems so far, and I felt like I found a goldmine. I understand this is very difficult, but it is worth while to research it.