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AI Methods for Algorithmic Composition: A Survey, a Critical View and Future Prospects by George Papadopoulous and Geraint Wiggins

In this paper, Papodopoulous and Wiggins presented a survey of algorithmic composition using artificial intelligence techniques. They summarized the advantages and disadvantages of each approach, discussed about the general issues among the methods, and proposed some desirable prospects for future research.

Algorithmic composition starts a long time ago with the Musical Dice Game by Mozart. The Illiac Suite for string quartet was the first computer-generated composition by Hiller and Isaacson in 1959, using random number generator and Markov chains. In the paper, Papodopoulous and Wiggins conducted a survey on research done before 1999, and described the representative systems in six categories according to the applied methods: mathematical models, knowledge based systems, grammars, evolutionary methods, systems which learn, and hybrid systems.

Three examples of mathematical models applied to algorithmic composition were stochastic (Markov chains), chaos, and information theory (entropy).These mathematical models own the advantages of real time computing, but suffer from the incapability of representing high level music structure. For the knowledge based system, three examples are given, including rule-based expert system, constraint logic programming, and case based reasoning. The common disadvantage of knowledge based system is the difficulty of knowledge elicitation. Devising generative grammars for composition is another type of approach, but it is computationally expensive and does not capture the semantics of the pieces well.

The fourth category is evolutionary methods, divided into two sub types according to the characteristics of the fitness function. The major drawback of evolutionary methods is the fitness function; the result is too subjective with a human fitness function. Many machine learning techniques were also applied in algorithm composition, especially artificial neural network. But learning everything without filtering and incapability of reproducing the original training piece weaken the system's performance. Some researcher combined methods from more than one categories, creating a hybrid system but were criticized as too complicated by the authors.

After reviewing those systems, Papadopoulos and Wiggins provided a discussion about three issues: evaluation, knowledge representation, and computational creativity. They found that (1) most of the system lack experimental and evaluation methodology; (2) knowledge representation should be designed with multiple viewpoints and should not result in huge search space; and (3) ambiguity needs to be tolerated in the representation so that elaboratable new combinations can be generated to model the creativity. For future research, the authors proposed several prospects including flexible representation, meaningful output, geometrical models congaing pitch space, and expressive performance.

This paper provides a comprehensive survey about algorithm composition systems. The authors studied many related work and provided a helpful comparison between those systems. I agree with most of the issues in the discussions and the prospects they

proposed. Some of those have received many attentions in these years. However, it is difficult to obtain the technical details of each method from this paper. For example, the goal of task in some systems seems to be vague and huge. It is hard to imagine how the method is applied to take every single parts of the composition. This is a good review paper, but it is most helpful only for the people who are already in the research filed.