

論文の内容の要旨

Automatic Music Composition from Japanese Lyrics with Probabilistic Formulation

(確率的定式化による日本語歌詞からの自動作曲の研究)

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This thesis contains discussions on the methods of automatic music composition, especially generating songs from Japanese lyrics. Songs are familiar genre of music and they are the media which we can communicate our messages emotionally with. Our aim is to achieve methods that can assist people to generate songs with automatic composition techniques. We will discuss that the difficulty of automatic song composition lies on both achieving the variety and the quality. We argue that the problem divided into three parts, (1) achieving variety, (2) generating with quality and (3) system designs for automatic composition. For problem (1), we discuss that songs can be decomposed into musical components such as melody, harmony and rhythm, and the variation emerges with the combinations of these musical components. The preliminary subjective evaluation indicated that varying the combination can help increasing the variety in songs. Secondly, we discuss the dependencies between these components and derive our method of generating variety with composition of various combinations of decomposed musical components. Finally, methods for achieving variety in each musical components is described, with ideas of “rhythm tree” and automatic generation of voicings with arbitrary input of harmony sequences by means of Hidden Markov Model. For problem (2), we firstly discuss the generating melody with quality is to minimize the probability of feeling odd about the song, thus the melody composition can be formalized as maximizing the probability given the constraints. Although there are two possibilities of obtaining the probabilities, we argue that setting probabilities regarding musical theories is the solution since there are few data which are consistent enough for training the model. Secondly, we will argue how we can create a melody with maximum probability, with the constraints given by the combinations of musical components. Since the constraints imposed on melodies are mainly local constraints, we can derive a method to generate melodies exploiting dynamic programming. The subjective evaluation of generated melodies in five-grade evaluations are also reported, which indicates that the method can create melodies following musical theory (average points: 3.64) and with certain musicality (average points: 3.52). Finally for problem (3), system designs for automatic composition systems are discussed. The operation results of these systems provide evidences that our methods can be exploited to create original songs easily.