Abstract of Doctoral Dissertation

Title：A Study of Reciprocal Perception Mechanisms of Music and Body Action Based on Analyses and Generations of Rhythm-based Video Game Charts

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The rhythm-based video game is one of the typical popular games. Players perform some actions corresponding to the music and the displayed chart. The chart would be considered as a result of the symbolization of the music. The required actions are the imitation of musical expressions, such as dancing or playing instruments. Therefore, the rhythm-based video game serves one of the aspects of music. Playing rhythm-based video game make players' musical recognition and expression skills improve.

In this paper, I figure out the perception mechanisms of music and body action bypassing the game chart. By analyzing the difficulty level of the rhythm-based video game, I find out that easy charts require few actions with easy rhythm while hard charts require many actions with a complex rhythm. I design features concerning factors that may characterize the charts. As conducting the k-means clustering with the features, the characteristically similar charts structure the clusters. To study the body action of players, I propose a method to estimate the player's movements for the given chart based on Hidden Markov Model.

I propose an automatic chart generation system that serves personalized charts for a given audio track as an application. It has been reported that the charts generated by the existing method do not have enough quality and have no characteristics. The proposed method automatically generates a chart that reflects the perception mechanisms. I propose a deep learning model that learns the relation between the lower and higher difficulty charts for the same song. For the task of estimating the timing to action for easy charts, this method outperforms the existing method with about 1.8 times higher F-score. By learning the relationships between songs and charts in each cluster, it was confirmed that the model can automatically generate the charts with the characteristics corresponding to the learning cluster.