The Complicated Interaction between Expert Breakdancers:
Distance as the Hidden Dimension

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In the performing arts, including dance, theatre, and music, performers present their art through complicated interactions with their co-actors, the audiences, and so on (e.g., Bailey, 1980; Walton et al., 2015). This study investigated the dynamics of these interactions, focusing on the battle scenes in breakdance as the target phenomenon.

In the battle scenes of breakdance, two dancers perform their dance in turn impromptu, adjusting to the music played by a DJ. In addition to the music, the performance of one dancer also influences on that of the other dancer. Furthermore, the opponent's performance affected by the dancer's performance or the music again influences on the next performance of the dancer. These dynamical interactions seems to be explained by the Dynamical Systems Theory that focuses on the interactions of multiple factors and emergences of some dynamical patterns (e.g., Haken, Kelso, Benz, 1985). We applied this theory to dancers' movements in the battle scenes.

In the analysis, we thought that the distance between two dancers in a battle scene indicates the patterns of their communication. Previous studies in social psychology suggested that distance between people is an important factor that affects their communication in the unconscious level (hidden dimension, Hall, 1959, 1966). Two groups of four expert breakdancers participated in the experiment. In the experiment of each group, four expert breakdancers conducted six battles in a round-robin, and we measured the distances between the dancers using motion capture. The distance data were analyzed using nonlinear time series analysis such as recurrence plot and cross recurrence plot. The results showed that clear distance patterns emerged during the battles. They also showed that the distance patterns changed as the performance proceeded.

Keywords
Interaction, Performing Arts, Breakdance, Dynamical Systems Theory, Nonlinear Time Series Analysis, Distance