

Mathematical Models of Perception and Generation of Art Works by Dynamic Motions

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Abstract: We are interested in the relationship between movements performed by artists and the resulting artworks, and we aim to evaluate and model how the characteristics of these motions and the underlying emotions of the artist are reflected in the painting. Additionally, we are studying the psychological and cognitive nature of art perception in order to correlate image properties resulting from different motion types with the aesthetic experiences of contemplators. We are especially investigating modern artworks inspired by the Action Painting style of Jackson Pollock.

We performed human experiments recording the dynamic motions while painting and used them in the optimization context to identify underlying objective functions of human motions. By implementing these kind of motions on a robotic platform, we can determine whether they cause reliable footprints in the resulting paintings and simulate how motion variations are reflected in them. Based on our previous work on motion optimization, we will pursue different optimization strategies for the robot arm movements and study their effect on the painting.

Additionally, we performed studies of human responses to paintings. To do so, we first developed an image analysis framework, that computes several image characteristics that are (qualitatively) known to influence how test subjects rate different paintings. We then asked people to sort and cluster different action-painting images and performed PCA and Cluster Analysis in order to determine image traits that cause certain aesthetic experiences in contemplators. Additionally, we asked the participants to answer some personality test questions to find out about personality aspects in art perception.

Together with our collaboration partners from psychology and art history, we will combine these two approaches to create a mathematical model for both creation and perception of artworks, which will enable a robotic platform to use feedback and create paintings in a similar way, humanartists do.

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