Computational Study of Jackson Pollock's Paintings: Colors, Process, and the Physics of Drip

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This summer, I studied many of the mathematical properties encoded in Jackson Pollock's paintings as well as his physical creation process in order to create a software that can computationally generate Pollock-inspired paintings. I implemented the program using Processing, a java-based environment widely used for generating visualizations. This research improves upon preliminary code written by Jeonguk Choi '18 and builds off Professor Irfan's previous research studying the mathematical structures in Pollock's paintings and how they can be used to authenticate his drip paintings. This program could help art historians better understand visually how the individual layers of a Pollock painting contribute to the overall appearance and fractal dimension of the final work. This research also contributes to the literature on how computers can 2-dimensionally address the physical process of applying and layering paint in a 3-D manner.

After a comprehensive literature review on many quantitative characteristics of Pollock paintings, I began to study Jeonguk Choi's preliminary code, where he utilized Bezier curves, curves drawn using four control points, to replicate the paint trails; in further research, Choi concluded that these curves can accurately represent the curvature of continuous paint trails. I decided to re-write his code to more closely follow Pollock's physical process as described by Taylor (2002) while continuing to utilize this type of curve.

Pollock's paintings exhibit statistical fractal structure, where the statistical qualities of a pattern repeat at increasingly smaller scales. The fractal structure can be quantified through a fractal dimension, a measure of the pattern's complexity ranging from 1 to 2. My program is able to calculate the fractal dimension of the output in real-time, which the program uses as a signifier to proceed in the painting process. Pollock began his paintings with an anchor layer of black curves of high curvature, which largely establishes the piece's overall fractal dimension. My program draws this black anchor layer and stops when the fractal dimension is close to the target. Next, the program draws a layer of transparent colored curves, which reflect Pollock's tendency to use highly viscous fluids that would seep into the canvas below and begin to obscure the anchor layer. After this layer, the fractal dimension is almost fully established, but Pollock refined the output with thin curves and irregular drips and marks, which the program includes.

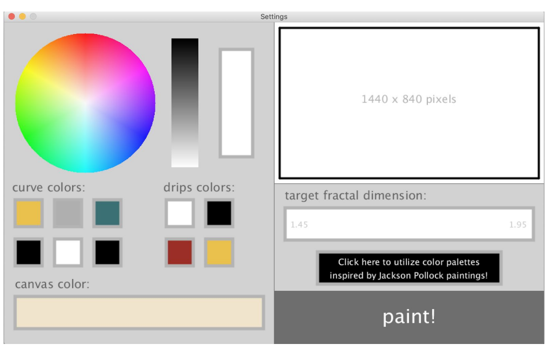

Figure 1: Settings window

Figure 2: Example of output, with fractal dimension 1.88

The program includes a Settings window that allows the user to customize several different aspects of the output, including the colors of the curves, the colors of irregular drips and shapes, the background color, the overall fractal dimension of the finished painting, and the dimensions of the canvas. These variables are automatically assigned with reference to Pollock's common selections, but the user can change these assignments. The user also has an option to choose from full color palettes specifically taken from several of Pollock's most famous paintings.

This research greatly expanded my understanding of a computer's ability to learn from and replicate human behavior. In the future, I'd like to further refine the output through a more comprehensive study of the random shapes in the background of Pollock's paintings. I would also like to utilize my new understanding of Processing to experiment further with computer-generated art.

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Zheng, Y., Nie, X., Meng, Z., Feng, W., & Zhang, K. (2015). Layered modeling and generation of Pollock's drip style. Visual Computer, 31(5), 589-600.