A Collaborative Painting Experience: Human-Machine Interaction on Canvas

Abstract

We introduce a novel approach to human-machine interaction, framed as a pictorial game where artists and a computer collaborate in iterative creative rounds. The computer uses machine learning to partially complete the artwork at each stage, projecting its additions directly onto the canvas, which the artists are then able to modify or incorporate. This process encourages creative exploration and provokes questions about the growing relationship between humans and machines.

1 Introduction

The ongoing technological advancements are reshaping human-machine interaction, providing new tools for artistic creation while simultaneously prompting contemplation on their effects on human creativity.

Generative Adversarial Networks (GANs) have demonstrated the creative abilities of neural networks, producing aesthetically full paintings. However, in these instances, humans serve as either engineers or curators. Our work introduces a new method of machine utilization, integrating it into the core of human creative processes. While painting, this approach presents humans with different paths and concepts for their artwork. This concept is approached through a unique interactive framework.

The artist duo Tina and Charly have previously investigated interaction through canvas art. To initiate their creative work, they select a theme and depict it in dark colors on a white canvas. They then start their game. At each round, using a vocabulary of strokes and symbols, Charly anticipates Tina's emotions and thoughts in red, before responding with green strokes on the painting. These rounds continue until both artists reach an agreement on finishing the painting. The entire process unfolds in silence, with the canvas serving as the sole medium of dialogue.

The purpose of our work is to introduce artificial intelligence as a third participant in Tina and Charly's dialogue. The AI initially captures a raw representation of the painting, then processes it to partially complete the work in progress, which it projects back onto the canvas. The artists then have the freedom to incorporate the machine's suggestion in blue, a color that has not been assigned to either player. The use of different colors allows for the analysis of each player's contributions.

2 Methodology

The engineered system includes a camera and a projector connected to a computer on a support. At each computer round, the system captures an image of the painting and analyzes it to extract the canvas strokes. This pre-processing is made robust to changes in lighting, ensuring that the interaction can be used seamlessly in any studio. These strokes then feed into a neural sketcher, which produces new strokes to be added to the painting. Post-processing is used to project those additions back onto the canvas.

The neural sketcher is a recurrent neural network, based on a recent improvement to the seminal work of previous research. It is trained using a sequence of points and a channel encoding for stroke breaks. The sketcher produces a similar series, which is then converted back into strokes on the original

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painting. The network was trained using the QuickDraw data set, enabling it to create human-like strokes. For integration with Tina and Charly's style, the learning was refined using a sketch database from previous paintings by the artists.

3 Discussion

The artists found the machine strokes to be surprising and suggestive of movements they would not have made on their own. Some painters have previously expressed how unintended strokes can be evocative. Our installation, where the machine projects completions without physically painting, and the generative network capabilities, allows this to be explored. Furthermore, the ability to change parameters, such as the learning data set, provides the artist with more control over their usage of the machine.

Our interactive installation can be used by anyone and aims to raise awareness and initiate thought about the interplay between humans and machines. This work highlights the need to make machines human-friendly, while also acknowledging how technology changes human behaviors and routines. Tina and Charly felt like they were interacting with a full-body system, which had been designed to simulate human-like painting. They experienced the machine as sometimes restricting, hard to understand, and sometimes magical. It infused new dimensions into the painting. The feeling that the machine could be collaborative or limiting is an echo of the role of technologies in our daily lives.

From an outsider's perspective, the machine changes their original painting style, both in the short term artworks (as seen in Figure 2), and on their long-term body of work, inspiring their machine-free paintings. Even though we have made the machine's influence explicit with its blue contributions, the interaction is not neutral.

4 Acknowledgments

The authors would like to thank Yana Hasson and Yann Labbé for coding insights, Erwan Kerdreux for art history discussions, and Thomas Lartigue for general discussions.