

Title: Human and Computer Cooperative Artistic Creation

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Background of the Invention

A. Field of the Invention

The invention relates to artistic creation and education in classical and digital mediums. Specifically, the field is that of drawing, digital drawing, music composition, digital music composition, and any artist creation that can be represented using discrete or digital units such as points, shapes, colors, pixels, notes, frequencies, timelines, or bits.

B. Prior Art

Interactive computer systems including software tools such as CAD and Photoshop offer interactive controls to assist in visual artistic creation. In addition, software tools such as FL Studio and Ableton Live offer interactive controls to assist in auditory artistic creation. These tools allow trained users to quickly build complex digital artistic creations.

These tools provide complex algorithms to add effects for filtering, mixing, cleaning, and smoothing artwork. However, no such tools exist that will mimic the user's behavior to draw, paint, or compose in the same manner as the human user. In other words, the computer software is not monitoring the human user's behavior and is not performing actions in a comparable way.

Summary of the Invention

We propose an automatic system that applies techniques from mathematical optimization, probability theory and statistics, and machine learning to assist in the artistic creation process by understanding the human's artistic creation process to the point that it can step-by-step create artistic works in a sequence of actions that mimics how a human would create artistic works.

In addition to creating artistic works, if a computer understands how a human creates an artistic work in a medium, then it can actually teach humans to create artistic works in that medium. Typically, classical artists and users of interactive computer systems spend years taking lessons with an instructor, practicing on their own, and reading books and tutorials. The problem is that untrained and new users need to learn how to create art. Early users require feedback on each action that they perform, detailed recommendations on the next action to perform, and something or someone who step-by-step cooperatively creates with them.

We developed a working embodiment of the invention that takes in an image and digitally paints an artistic creation that greatly resembles a classical painting based on the image. See FIG. 1 for an example illustrating the output that was automatically produced by our embodiment. Our embodiment creates the artwork step-by-step by drawing brush strokes in a similar manner as a human. The brush strokes are represented by a width, a color, and a start and finish point. They may additionally include a direction, a visual animation, and a blending factor. Each brush stroke is selected by a combination of repeated

random sampling from a fixed distribution and selecting a high scoring brush stroke based on a scoring function.

Further, the embodiment is being adapted to allow for cooperative artistic creation where the embodiment provides feedback on each action that the user performs using medium specific scoring functions, detailed recommendations on the next action to perform based on medium specific sampling and scoring, and an autcreate feature that step-by-step automatically performs human-like artistic creation actions.

Brief Description of the Drawings

FIG. 1 an example illustrating the output from a working embodiment of our invention.

FIG. 2 illustrates the underlying logic behind the procedural generation of artistic creation actions, recommendation of artistic creation actions, and evaluation of human artistic actions.

Detailed Description of the Invention

The invention's primary function is to perform, recommend, and evaluate individual actions that make up the artistic creation process. The invention performs, recommends, and evaluates individual actions through a process represented in FIG. 2.

First, a trigger is fired either by the user or automatically to start the action selection and evaluation phase. This trigger is either fired to perform an action, to assist in performing an action, or in response to an action that was just performed.

If the trigger was fired to perform an action or to assist in performing an action, then the action selection and evaluation phase will select an action possibly through repeated sampling from a distribution of actions and evaluating the actions based on scoring, cost, and optimization functions or through other means that include evaluating the actions based on scoring, cost, and optimization functions in addition to optionally sampling possible actions through other means, comparing with the history of past performed actions, and/or applying shallow or deep learning techniques to optimize parameters for scoring, cost, and optimization functions. If the trigger was fired to perform an action, then following the action selection and evaluation phase an action will be performed. If the trigger was fired to assist in performing an action, then following the action selection and evaluation phase, an action will be recommended.

If the trigger was fired in response to an action that was just performed, then the performed action will be evaluated based on scoring, cost, and optimization functions in addition to optionally, through shallow or deep learning techniques, updating optimized parameters for scoring, cost, and optimization functions.

References

C. Corp, "Controls for Drawing Images on Computer Displays." U.S. Patent 5,299,307 issued March 29, 1994.

Claims

A medium specific artistic creation tool that automatically step-by-step creates artistic works where each step-by-step action is performed in a comparable way to human artist through an action selection procedure that includes the use of a scoring, cost, or optimization function.

A medium specific artistic creation tool that cooperatively step-by-step creates an artistic work with a human where each step-by-step non-human action is performed in a comparable way to a human artist through an action selection procedure that includes the use of a scoring, cost, or optimization function.

A medium specific artistic creation tool that cooperatively provides step-by-step automatic feedback, actionable step-by-step automatic recommendations, and/or step-by-step autcreation actions through the use of a selection procedure and/or evaluation procedure that includes the use of a scoring, cost, or optimization function.

A digital painting and/or digital drawing artistic creation tool that cooperatively provides step-by-step automatic feedback, actionable step-by-step automatic recommendations, and/or step-by-step autcreation actions through the use of a selection procedure and/or evaluation procedure that includes the use of a scoring, cost, or optimization function.

A music composition and/or audio creation tool that cooperatively provides step-by-step automatic feedback, actionable step-by-step automatic recommendations, and/or step-by-step autcreation actions through the use of a selection procedure and/or evaluation procedure that includes the use of a scoring, cost, or optimization function.

Abstract

We propose an automatic system that applies techniques from mathematical optimization, probability theory and statistics, and machine learning to assist in the artistic creation process by understanding the human's artistic creation process to the point that it can step-by-step create artistic works in a sequence of actions that mimics how a human would create artistic works.

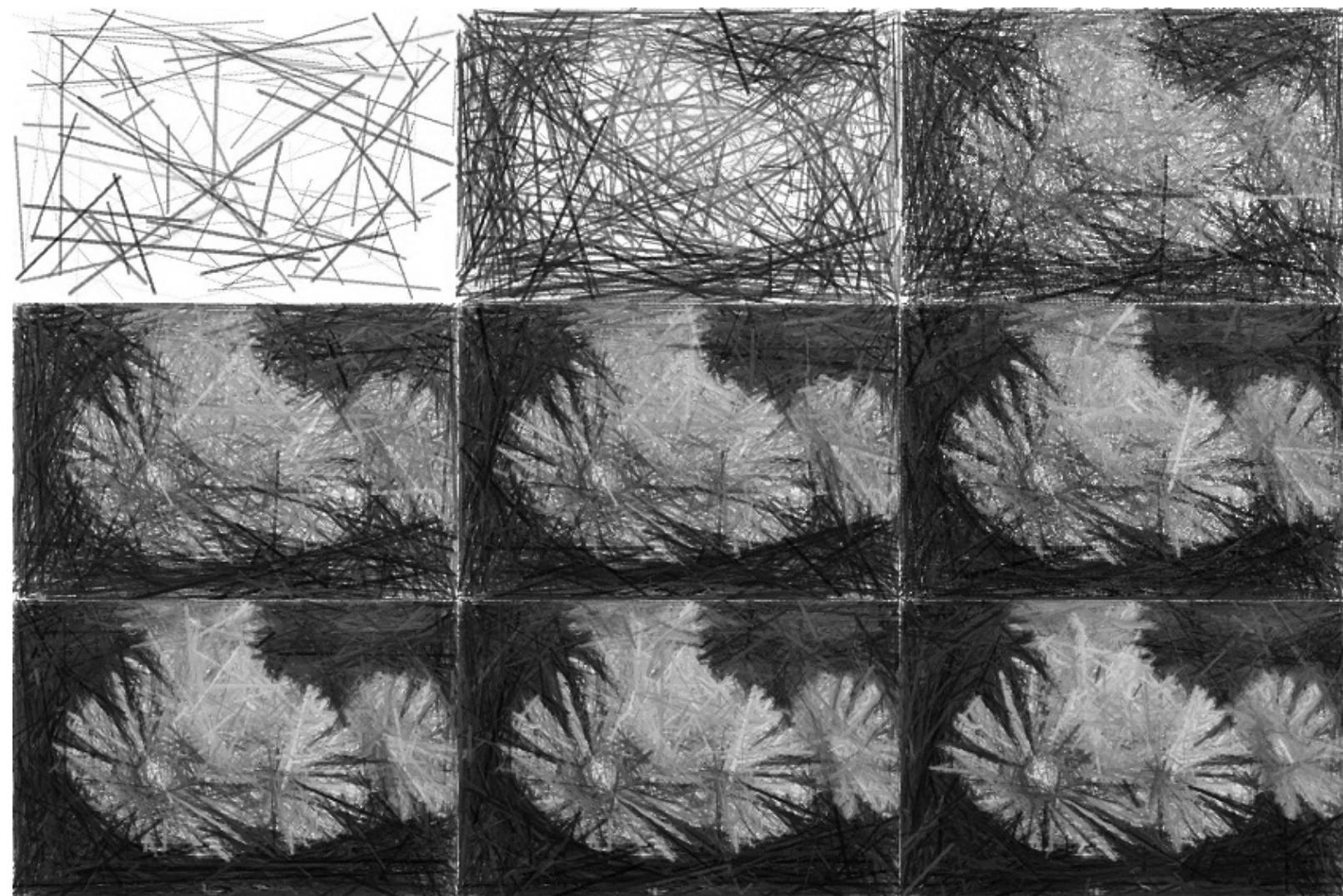


FIG. 1

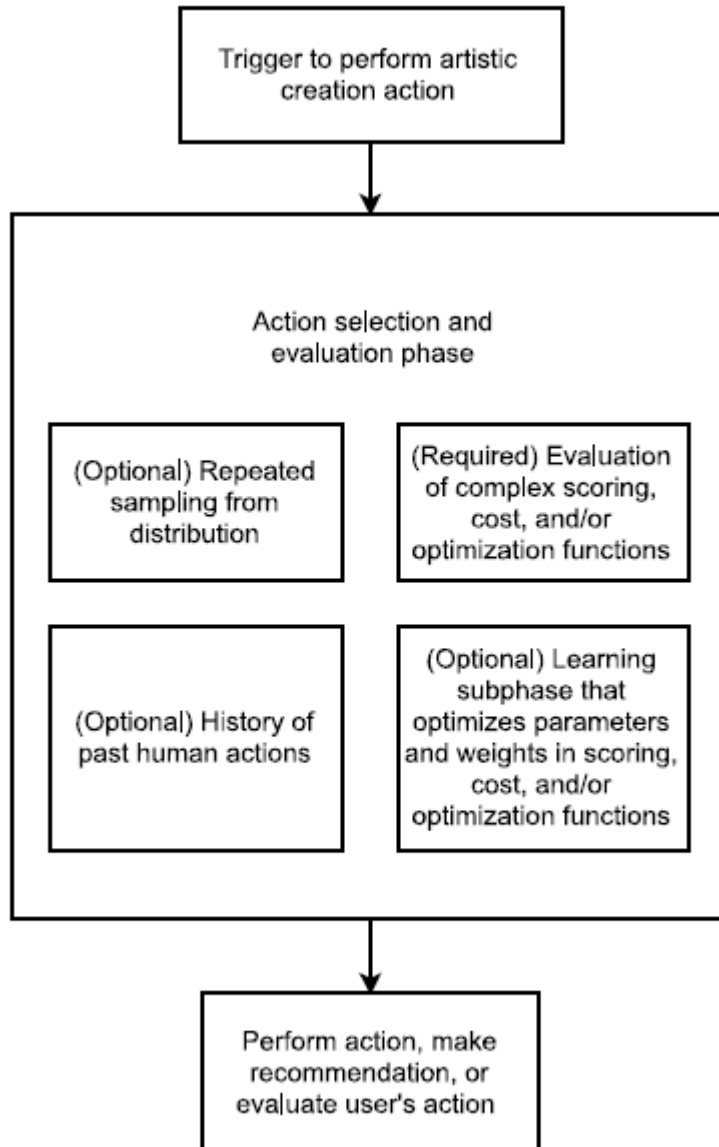


FIG. 2