COMPUTATIONALLY RENDERED PAINTERLY PORTRAIT SPACES

*Steve DiPaola**

Is it possible to computationally model the open methodology that fine art portrait painters have used for centuries, into a computer system? A computational system which is capable of producing creative art work on its own from sitter photographs and in doing have a interdisciplinary toolkit that artists, scientists and critics can use to understand and explore the creative artistic process?
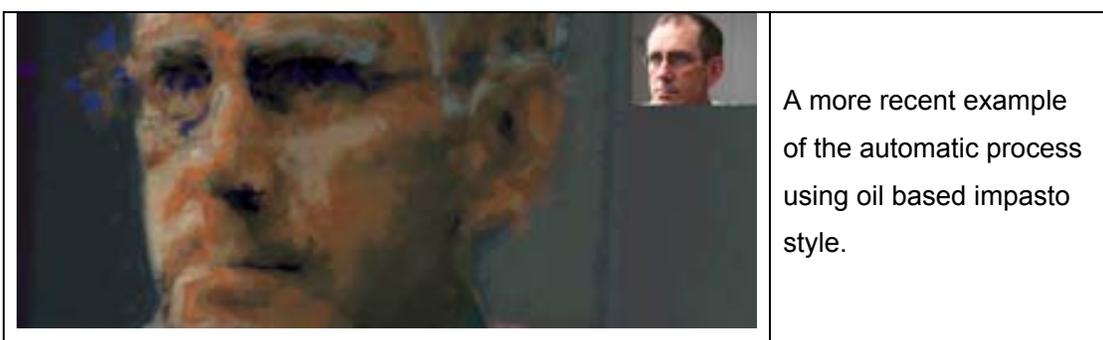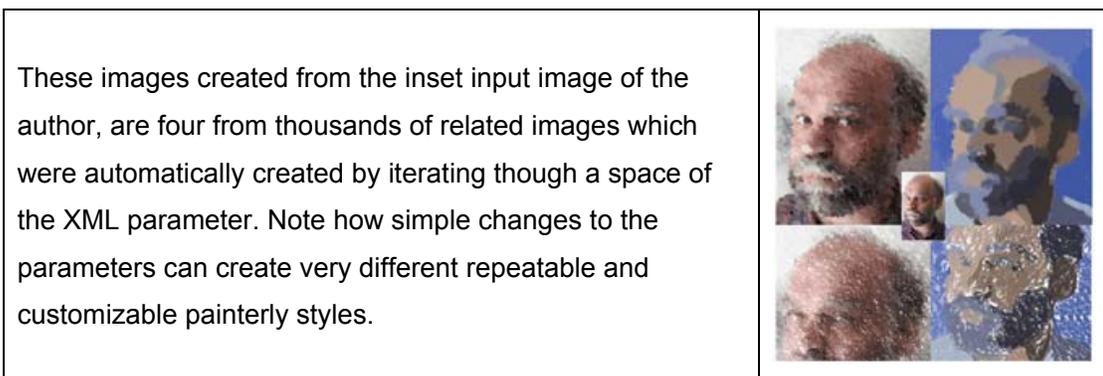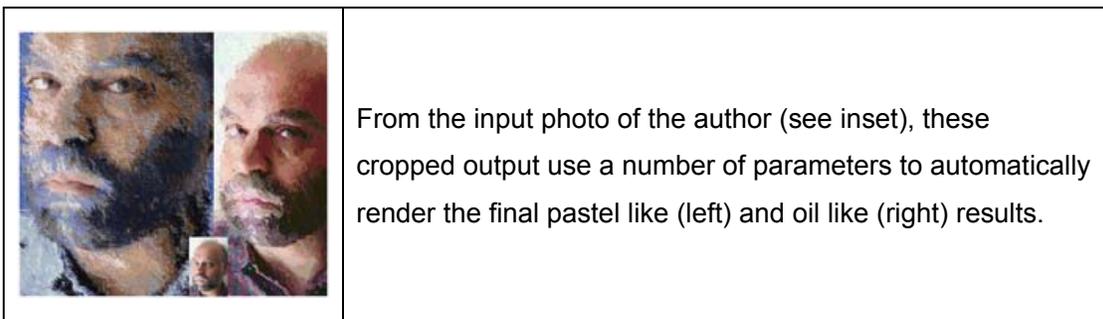
This work is ongoing output from research work by Steve DiPaola that attempts to build a computational painting system (called 'painterly') that allows aspects of art (the creative human act of fine art painting) and science (cognition, vision and perception; as well as computational design) to both enhance and validate each other. The research takes a novel approach to non photorealistic rendering (NPR) which relies on parameterizing a semantic knowledge space of how a human painter paints, that is, the creative and cognitive process. This approach has two significant benefits and therefore two intertwining and interdisciplinary research outcomes. The first benefit is creating a new type of painterly NPR system with both a wider range and improved results compared to current techniques. The second benefit, is that portrait artists over 1000's of years have somewhat intuitively evolved a 'painting methodology' which exploits specific human vision and cognitive (neural) functions, and therefore when presented in a quantitative way (from our system) can shed light on psychological research in human vision and perception (or at least validate it via another method). The reverse is also true - via this system and process, cognitive scientists can understand artistic technique (which can be useful in many areas including how to make design systems creative).

The presented images are ongoing visual results of the 'painterly' system which takes as input, people-based, non-professional photographs (shown as inserts in the images) and XML based configuration parameters which represent the customizable painterly knowledge. Small changes to the parameters account for different fine art styles. All images were generated automatically by the system -- no hand editing, painting or retouching of any kind was used except slight editing for the two Rembrandt pieces, since specific artifacts were needed in the imagery for our eye tracking experiments. While Rembrandt isn't the best target output for 'painterly', we are using the system in this case, for eye tracking experiments to prove a theory DiPaola has written about, that Rembrandt, in his late portraits reacting to Italy and Titian, seemed to have intuited

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knowledge of human central visioning, well before scientists discovered it and exploited it in his paintings (using lost & found edges, center of interest focusing, etc) to guide the viewers eye path. While these techniques are known by modern painters, they are not associated with Rembrandt or the Renaissance period. DiPaola and a team of vision perception experts, hope to prove this theory with an empirical study using the 'painterly' system.

Our ongoing goal is to build up high-level constructs using additional vision and perception techniques that support the portrait painter knowledge, allowing for an interdisciplinary system which has research benefits for NPR as well as art theory and cognitive science.

Additional information of DiPaola's painterly system as well as his research and art gallery web sites can be accessed from http://www.dipaola.org.

From the input photo of the author (see inset), these cropped output use a number of parameters to automatically render the final pastel like (left) and oil like (right) results.

These images created from the inset input image of the author, are four from thousands of related images which were automatically created by iterating though a space of the XML parameter. Note how simple changes to the parameters can create very different repeatable and customizable painterly styles.

A more recent example of the automatic process using oil based impasto style.

Rembrandt Images (2): These images which use students as input, specially were created to reside in the painterly space of specific late Rembrandt portraits. As discussed above they show one way that the system can be used as a toolkit for artists, scientist and critics to explore artistic and creative practice, in this case validating that Rembrandt intuited human central visioning long before scientists understood how the fovea and eye movement operated.

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* Steve DiPaola, both an active artist and scientist, delves into the concepts of the virtual and the social by creating virtual human and community systems in his both research and art work. An Associate Professor at Simon Fraser University, Steve directs the I-Viz Lab (ivizlab.sfu.ca) which strives to make computer systems bend more to the human experience. He came to SFU from Stanford University and before that spent 10 years as a senior researcher at NYIT Computer Graphics Lab, an early pioneering lab in high-end 3D techniques. He has held senior positions at Electronic Arts and Saatchi & Saatchi Innovation and has consulted for HP, Kodak, Macromedia and the Institute for the Future. His artwork has been exhibited internationally including the A.I.R. and Tibor de Nagy galleries in NYC as well as the Whitney Museum of Art, and the IBM Gallery of Science and Art. He co-curated the first computer art show in a major NYC gallery in 1988. See www.dipaola.org.