

Vector Graphics Grammars

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Context : Procedural methods are a promising alternative to data-driven methods in computer graphics and animation, but they are difficult to use in practice because there is no clearly defined methodology for designing a grammar that fits the designer's aesthetics goals. In a recent paper, Talton et al. have proposed Markov-chain Monte Carlo inference methods for bringing artistic control to grammar-based procedural models in Computer Graphics by using example images. In this internship, we would like to propose extensions of that approach for capturing the visual styles of paintings and generating vector graphics art the same style.

Objectives : The main objective of the project is to create computer animations "in the style" of paintings. Shape grammars have been used in the past for generating paintings "in the style" of famous abstract painters, including Kandinsky and Miro [3,4]. Talton et al. [1] used a stochastic, context-free grammar for representing the space of "Mondrian-like" paintings [2], and showed how to build a likelihood function that rewards productions of the grammar that (to their eyes) present the aesthetics qualities of the Mondrian style.

Recently, we derived a method for decomposing the pictorial vocabulary of figurative artist Keith Haring into 3D primitives, and re-assembling them into novel pictures using plex grammars [5].

In this internship, we would like to extend that method in two novel directions. First, we would like to learn stochastic, rather than deterministic plex grammars, in order to better capture the painting styles of the examples. Second, we would like to generate vector graphics art, rather than 3D shapes. Thus, the plex grammar will need to be adapted to the production of "vector graphics complexes" [6]. Those two extensions raise original and difficult issues in their own right. They require innovations in statistical learning as well as computer graphics.

To resolve those problems, the candidate will propose, implement and validate novel methods for learning

parameters of a stochastic plex grammar directly from vector graphics art reproducing paintings. He will build likelihood functions that rewards the production of animations that look like the original paintings at all times. The internship will use and contribute to the open source « vpaint » toolkit [7].

This Master 2 internship is likely to lead to a PhD thesis on the related topic of producing computer animation, rather than static pictures, from examples, using the recently proposed framework of « vector animation complexes » [8].

References

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