

# Vector Graphics Grammars



## Advisor

Rémi RONFARD, IMAGINE team, INRIA Grenoble Rhone Alpes  
E-mail : remi.ronfard@inria.fr

## 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. Given a grammar and a high-level specification, the method computes a production from the grammar that conforms to the specification.

In this internship, we propose extensions of that approach for capturing the visual styles of paintings and generating vector graphics animation in the same style.

## Objectives

The main objective of the project is to create computer animations "in the style" of paintings.

In their paper, Talton et al. [1] used a stochastic, context-free grammar for representing the space of "Mondrian-like" paintings [2]. Similar methods had been used in the past for generating

pairing "in the style" of famous abstract painters, including Kandinsky and Miro [3,4]. The novelty in their approach is that they also 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 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]. Second, we would like to extend the grammar to generate computer animation, rather than static pictures. 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.

This Master 2 internship is likely to lead to a PhD thesis on a related topic.

## Keywords

Shape Grammars, Procedural Modeling, Vector Graphics.

## References

- [1] Jerry O. Talton, Yu Lou, Steve Lesser, Jared Duke, Radomír Měch, and Vladlen Koltun. Metropolis procedural modeling. *ACM Trans. Graph.* 30, 2, Article 11 (April 2011).
- [2] D. Andrezejewski, D. Stork, X. Zhu, R. Spronk. Inferring compositional style in the neo-plastic paintings of Piet Mondrian by machine learning. *Computer Vision and Image Analysis of Art*, 2010.
- [3] Raymond Guido Lauzzana and Lynn Pocock-Williams, "A rule system for analysis in the visual arts", *Leonardo*, Vol. 21, No. 4 (1988).
- [4] Joan L. Kirsch and Russell A. Kirsch: *The Anatomy of Painting Style: Description with Computer Rules*. *Leonardo*, Vol. 21, No. 4 (1988).
- [5] Rémi Ronfard and Quentin Doussot. Generating 3D Scenes in the style of Keith Haring. *Generative Arts Conference*, 2012.
- [6] Boris Dalstein, Rémi Ronfard, Michiel Van De Panne. Vector Graphics Complexes. *ACM transactions on Graphics, Proceedings of ACM SIGGRAPH 2014*.