

Generative Art For Image Reconstruction

January 4, 2022

Problem statement: Given a (color) model image, the goal is to automatically recompose it from a set of overlapping translucent geometric primitives, e.g. polygons (see Figure 1). Such a problem can be cast as an image compression one since we aim at using the smallest possible number of primitives to reconstruct the model image. Nevertheless, the purpose here is not to recover an accurate representation of the latter but instead to provide an artistic view of it in the spirit of what is done by algorists [1]. Whatever the targeted application, such a problem can be solved independently of the image resolution, which is a strong advantage since all primitives scale nicely. In the literature, most of the methods focus on genetic algorithms due their ability to solve complex tasks. However, the number of their parameters and the use of various adhoc strategies make them particularly difficult to adapt to the considered problem.



Figure 1: Example of reconstruction (right) from a color image (left).

Objectives: Firstly, the student will consider the possibility to model the problem in a variational framework using Marked Point Processes [2] and solve it based on efficient graph-based algorithms [3]. Secondly, a comparative study against standard approaches will be conducted and parameters will be tuned appropriately. Thirdly, machine learning approaches will be considered for boosting the convergence of such an approach.

Prerequisites: A highly motivated candidate is expected at master level (or equivalent) with a good mathematical and image processing background as well as good programming skills and technical english level. Knowledge in optimization is preferred but not mandatory.

Duration/salary: From 4 to 6 months / About 530 euros per month.

Ph.D. continuation: Possible.

Location: The internship will take place in the SATIE lab at Gif-sur-yvette (30 minutes from Paris).

Contact: Please feel free to send an e-mail to nicolas.lerme@universite-paris-saclay.fr.

References

- [1] Gratin: Research group in interactive and/or digital art and technology. <https://www.gratin.org/>, 2000.
- [2] F. Lafarge, G. Gimel'farb, and X. Descombes. Geometric feature extraction by a multimarked point process. *Pattern Analysis And Machine Intelligence*, 32(09):1597–1609, 2010.
- [3] E. Soubies, P. Weiss, and X. Descombes. A 3D segmentation algorithm for ellipsoidal shapes - Application to nuclei extraction. In *Proceedings of International Conference on Pattern Recognition Applications and Methods (ICPRAM)*, pages 97–105, 2013.