Artistic Image Compression

Context: Sometimes, computer science and art are intertwined to provide an intense and deep user experience. In 2008, Roger Johansson released a piece of software [1] aiming at constructing artistic views of 2D images using a small number of transparent and colored shapes such as polygons, circles, rectangles, etc. Such an approach (called vectorization) has one major benefit: The resulting decomposition is invariant to scale. However, existing strategies still suffer of poor convergence speed. The purpose of this work is to explore ways to improve this convergence either by using more sophisticated optimization algorithms (e.g. Marked Point Processes [LGD10]), benefit of GPUs to speed up rasterization operations, apply reinforcement learning algorithms to predict good configurations of objects to sample [SB18], use multi-scale approaches or propose new fitness functions for measuring error between resulting and ideal images.


Scientific aims:

- Establish a detailed state-of-the-art.
- Implement several algorithms to solve the problem.
- Evaluate and compare the performance of these algorithms on images.
- Publish results in a peer-reviewed journal article.

Profile: Students at M.Sc. level (Master 2 or equivalent) with good mathematical background and excellent programming skills (e.g. Python, Matlab or C/C++) are expected. Moreover, abilities to deal with LaTeX software is required. In particular, notions in optimization are preferable but not mandatory.

Location: The internship will take place in the SATIE lab of the ENS Paris-Saclay at Gif-sur-yvette (91), a stimulating and valuable environment. The University Paris-Saclay belongs to the top-ranked research places in the world. A number of food markets and transportation exist (buses, RER B, cars, etc.).

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References

[LGD10] F. Lafarge, G. Gimel'farb, and X. Descombes. Geometric feature extraction by a multi-marked point process. *Pattern Analysis And Machine Intelligence*, 32:1597–609, 2010.

[SB18] R.S. Sutton and A.G. Barto. *Reinforcement Learning: An Introduction*. MIT Press, Cambridge, 2018.

[1] More details and examples are made available at https://rogerjohansson.blog/2008/12/07/genetic-programming-evolution-of-mona-lisa/.