

Abstracting the Abstract

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Swarm art is a contemporary trend in which artificial intelligence models with swarming behavior are employed for generating artworks or ornamental objects. *Abstracting the Abstract* is a swarm art project that uses an ant-based clustering algorithm called KANTS¹ as a central piece of a creative environment that generates abstract “interpretations” of famous nonfigurative paintings of the early and mid-twentieth century. The proposal continues a line of work that I have initiated in 2008, which deals with art and science, distributed creativity, digital data and swarm systems. Meanwhile, *Abstracting the Abstract* project moves that line of work from the figurative to the abstract.

In 2008 I began to use an artificial ant colony system — originally proposed in 2000 by Vitorino Ramos and Filipe Almeida² — as a tool for exploring the boundaries of photography, creativity and authorship. Although I have been working with photography since the mid-1990s, I used the swarm system for recreating photographs taken by other authors, some of them anonymous (as in *Timor Mortis Conturbat Me*³, presented in an art gallery in Lisbon, in 2008), others with a body-of-work that is central chapters to the History of Photography (like the *Horse and the Ants*⁴, inspired by Eadweard Muybridge, and presented in several art shows since 2009 — see Figure 1). In order to describe the system and its close relationship with photography, I coined the term *pherographia*⁵, which means *drawing with pheromones*.

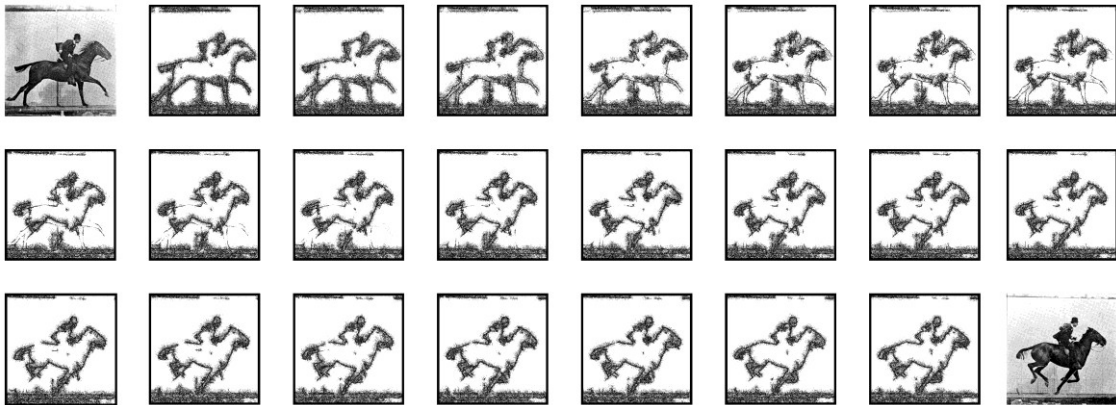


Figure 1. Carlos M. Fernandes, *The Horse and the Ants*, pherographia, digital print, 250×100cm, 2009 (after Eadweard Muybridge).

¹ A. Mora, C.M. Fernandes, J.J. Merelo, V. Ramos, J.L.J. Laredo, A.C. Rosa, “KohonAnts. A Self-Organizing Ant Algorithm for Clustering and Pattern Classification,” In *Proceedings of the 11th International Conference on Artificial Life*, S. Bullock et al., Eds., MIT Press, Cambridge, MA, pp. 428-435, 2008.

² Ramos, V., Almeida, F. “Artificial Ant Colonies in Digital Image Habitats: a Mass Behaviour Effect Study on Pattern Recognition,” in *Proceedings of the 2nd International Workshop on Ant Algorithms*, pp. 113-116, 2000.

³ P4Photography, Lisboa, 2008 (<http://www.p4photography.com/gallery/detail/8> and http://carlosmfernandes.com/index_archivos/Page768.htm)

⁴ L. Courchesne, C. Gagné, P.L. Lanzi, J. McCormack, “GECCO 2009 Evolutionary Art Competition,” 2009 (<http://www.sigevo.org/gecco-2009/competitions.html#ea>)

⁵ C.M. Fernandes, “Pherographia: Drawing by Ants, Leonardo,” MIT Press, Vol.43(2), pp.117-12, 2010.

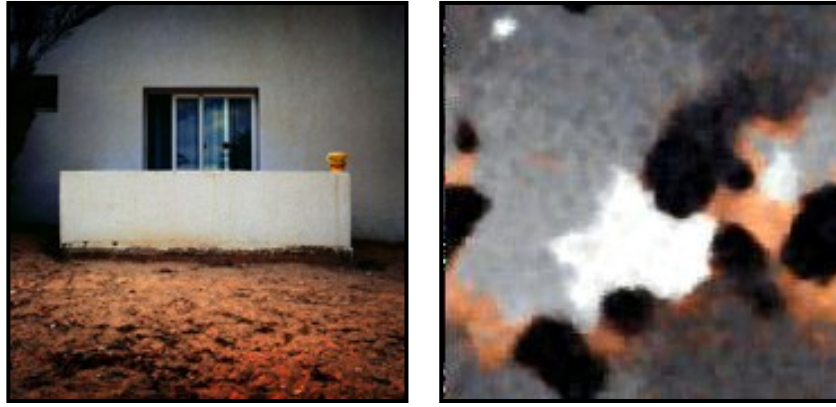


Figure 2. A photograph (left) and the pheromone map (right) shaped by a KANTS swarm of data samples that represent the RGB vectors of every pixel of the original 120x120 image. (photo: Carlos M. Fernandes, 2010).

Pherographia is an interesting basis for investigations on the concept of authorship, but it is limited, in the sense that the result of its application to any image is a figurative vision of that same image, without added value by the swarm, except a sketch of the original photo. KANTS explores another level of computational creativity and swarm art. Although based on the same artificial ant colony (proposed by Chialvo and Millonas in 1995⁶), KANTS, unlike *pherographia*, it is not designed to detect edges in 2-dimensional images; instead it identifies patterns in large data samples. While the ants of the *pherographia* system are able to detect information (contrast) in the environment (image), KANTS is able to self-organize the information carried by the ants (not necessarily from a digital image) and change the environment according to the type of those samples. If that information comes from a digital image, i.e., if the data samples are, for instance, the RGB values of every pixel that composes a photograph, the swarm will find (chromatic) relationships between the samples, cluster similar samples and shape the environment in a way that reflects the size and type of those clusters.

An example of the application of KANTS to a photograph is shown in Figure 2. The result is clearly different from the original reference. As a matter of fact, it is independent from any real-world visual reference. While the result of *pherographia* is figurative, the outcome of KANTS, when applied to an image, is clearly abstract (even under a strict definition of abstract representation of forms and colours: a language that creates compositions that are independent of any real-world visual reference). While my practice with *pherographia* intended to give an alternative perspective of the real, *Abstracting the Abstract* uses KANTS for generating a second-order abstract imagery, by loading the swarm with RGB values taken from digital files that represent well-known abstract paintings.

⁶ D. Chialvo, M. Milonas, "How Swarms Build Cognitive Maps," Luc Steels (Ed.), *The Biology and Technology of Intelligent Autonomous Agents*, No. 144, NATO ASI Series, 1995, pp. 439-450.

The first experiments with KANTS outside a purely scientific framework used data from Electroencephalogram (EEG) signals of sleeping patients⁷ for creating the *sleep pherogenic drawings* (from *pheromone+genesis*). This project goes a step beyond, while, at the same time, closes the cycle initiated with pherographia, since, again, images are the raw material with which the algorithm works and shapes the final result. Results are shown in Figures 3-7. With this work, I propose a wide-range distributed creativity, which involves several agents: the drawings are, in part, generated by the original painting/author, since the data samples are the raw material that shape the environment, and in part created by the swarm and its local rules, from which global and complex behavior emerges. My role is to set the parameters, trigger the system and wait for the results to appear.

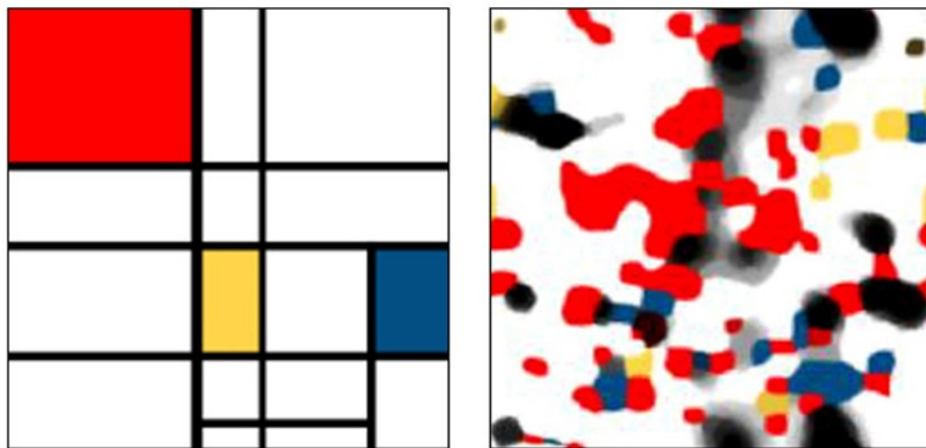


Figure 3. Carlos M. Fernandes, *Abstracting the Abstract #1*, 2012. Piet Mondrian's *Composition in Red, Blue and Yellow* (left) and KANTS pherogenic drawing (right).



Figure 4. Carlos M. Fernandes, *Abstracting the Abstract #2*, 2012. Wassily Kandinsky's *Improvisation* (left) and KANTS pherogenic drawing (right).

⁷ C.M. Fernandes, "Pherographs and Other Hidden Landscapes," to appear

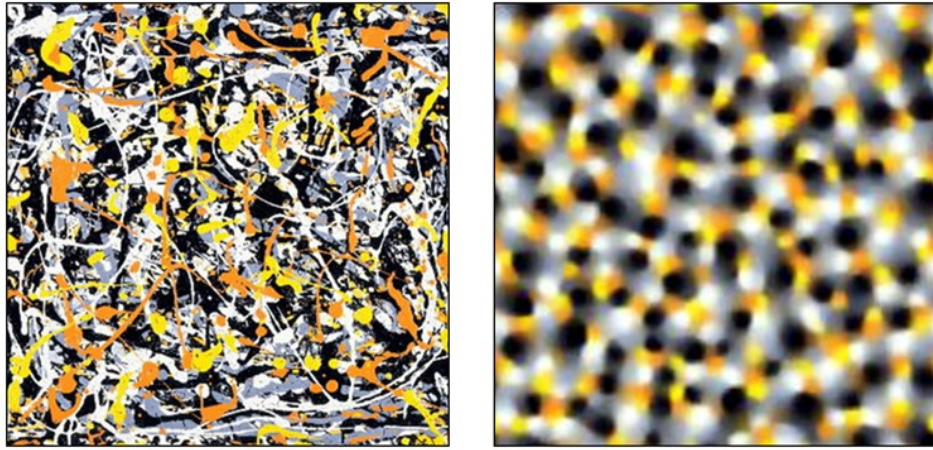


Figure 5. Carlos M. Fernandes, *Abstracting the Abstract #3*. Jackson Pollock's *Number 7*(detail) (left) and KANTS pherogenic drawing (right).

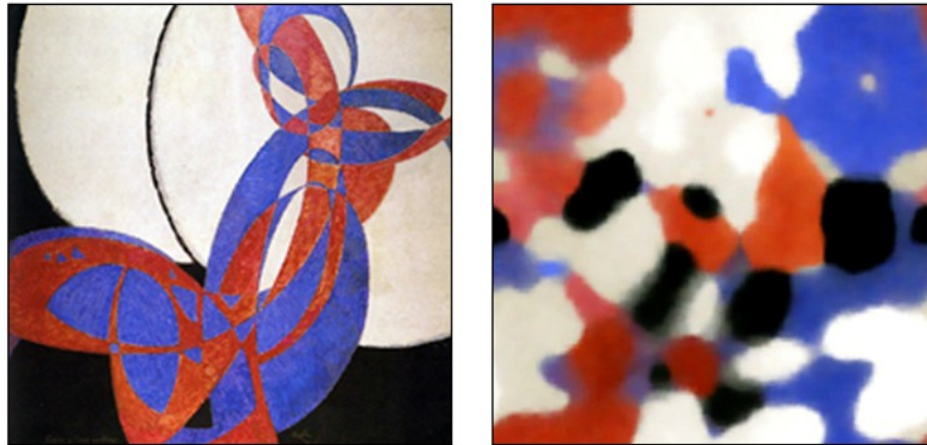


Figure 6. Carlos M. Fernandes, *Abstracting the Abstract #4*. František Kupka's *Fugue in Two Colors* (left) and KANTS pherogenic drawing (right).



Figure 7. Carlos M. Fernandes, *Abstracting the Abstract #2*. Joan Miró's *The Birth of Day III* (left) and KANTS pherogenic drawing (right).