

Belgrade researchers view art as self-organization process

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A still-life painting by Charlotte Caspers commissioned by Ingrid Daubechies and the Art Investigation group at Princeton University. The canvas is a crude, absorbing jute-type. Soft brushes were used. Credit: arXiv:1506.04356 [cs.CV]

How do you tell an original from a fake original? Two Belgrade researchers said they have a method that does not need any prior knowledge on the originality of the work of art. The authors' method is illustrated by recognizing the original paintings from the copies made by the artists themselves, including the works of surrealist painter Magritte. (They said that "Magritte was highly skilled in copying his own work and

that perhaps he devised a special technique for that purpose, a practice that would be in the spirit of surrealism and surrealists.")

"The Artists who Forged Themselves: Detecting Creativity in Art" is the work of two Belgrade researchers. The paper was posted this month on the arXiv server.

They wrote that "experts often rely on a combination of technical data obtained by the use of sophisticated equipment for mechanical, chemical and optical inspection of the art works and the visual inspection by art scholars supplemented by information provided by [art historians](#)."

Scientific advances in image processing techniques have reached a stage, they noted, where they can analyze painting features such as texture and brushstrokes, "using 2-dimensional wavelet transform or its complex counterpart." All [image processing](#) methods in general, they said, require the original work of art or the training set of original paintings, in order to make the comparison with the works of doubtful origin or uncertain authorship. The two researchers go off on their own path,

"Our approach is based on the premise that the creativity is a process of artist's self-organization on the mental level reflected in the self-organization of forms, patterns, textures and brush strokes of the painting which determine the aesthetic quality of the artwork."

They wrote that "complexity and self-organization are numerical quantities which could be used to differentiate between an original, creative, artistic intension and realization from the technical process which produces a copy of the work of art."

Kelsey Campbell-Dollaghan in *Gizmodo* said "as computer vision gets more and more complex, it's fascinating to watch it reveal new things about the way our own [brains](#) and optical systems work together."

MIT Technology Review, in an overview of their research, discussed their hypothesis, that "the action of creating original [art](#) is part of a self-organizing process orchestrated by the brain. As such, it leads to a unique level of complexity in the way paint and colors are used and distributed. By contrast, the process of copying is much more methodical and leads to lower levels of complexity. And this difference should make it possible to distinguish originals from [copies](#)."

Milan Rajkovic is from the Institute of Nuclear Sciences Vinca, University of Belgrade, Serbia. Milos Milovanovic is from the Mathematical Institute of the Serbian Academy of Sciences and Arts.

More information: The Artists who Forged Themselves: Detecting Creativity in Art, arXiv:1506.04356 [cs.CV] arxiv.org/abs/1506.04356

Abstract

Creativity and the understanding of cognitive processes involved in the creative process are relevant to all of human activities. Comprehension of creativity in the arts is of special interest due to the involvement of many scientific and non scientific disciplines. Using digital representation of paintings, we show that creative process in painting art may be objectively recognized within the mathematical framework of self organization, a process characteristic of nonlinear dynamic systems and occurring in natural and social sciences. Unlike the artist identification process or the recognition of forgery, which presupposes the knowledge of the original work, our method requires no prior knowledge on the originality of the work of art. The original paintings are recognized as realizations of the creative process which, in general, is shown to correspond to self-organization of texture features which determine the aesthetic complexity of the painting. The method consists of the wavelet based statistical digital image processing and the measure of statistical complexity which represents the minimal (average) information necessary for optimal prediction. The statistical complexity

is based on the properly defined causal states with optimal predictive properties. Two different time concepts related to the works of art are introduced: the internal time and the artistic time. The internal time of the artwork is determined by the span of causal dependencies between wavelet coefficients while the artistic time refers to the internal time during which complexity increases where complexity refers to compositional, aesthetic and structural arrangement of texture features. The method is illustrated by recognizing the original paintings from the copies made by the artists themselves, including the works of the famous surrealist painter René Magritte.

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