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How Machine Vision Solved One of the Great Mysteries of 20th-Century Surrealist Art

The great Belgian surrealist Magritte painted two versions of one of his masterpieces, and nobody has been able to distinguish the original from the copy. Until now.



In 1983, a painting by the Belgian surrealist René Magritte came up for auction in New York. The artwork was painted in 1948 and depicts a bird of prey morphing into

a leaf which is being eaten by a caterpillar—perhaps an expression of sorrow for the Second World War, which Magritte spent in occupied Belgium.

But experts soon noticed a problem. An almost exact copy of the painting already hung in a gallery in Europe, and the question immediately arose as to whether this one was a forgery. After extensive analysis, art experts agreed that both pictures were almost certainly painted by Magritte himself, perhaps as a joke—he was a surrealist, after all—or more likely because he had two collectors interested in the same painting and wanted both sales.

Today, these paintings hang in the Barber Museum of Fine Arts in Birmingham, England, and in the Musées Royaux des Beaux Arts in Brussels. They have even been shown together to allow further study of their similarities.

One issue has yet to be resolved, however. Which of these paintings is the original and which the copy?

Today, we get an answer of sorts thanks to the work of Milan Rajkovic at the University of Belgrade and Milos Milovanovic at the Mathematical Institute of the Serbian Academy of Sciences and Arts, both in Serbia.

These guys say the process of creating an original work of art is different from the process of copying, and this leaves subtle signs in the painting's execution. With the help of machine-vision analysis techniques, these guys say, they can now say which is which for the first time.

Their technique is based on an analysis of work by the contemporary Dutch artist Charlotte Caspers, who was commissioned a few years ago to create a set of seven artworks using various methods and then copy them as closely as possible a few days later.

Caspers duly performed the task, noting that the process of copying was an entirely different endeavour from the process of creating original art. Copying, she said, took at least twice as long. Nevertheless, she was confident that it would be impossible for anybody else to tell the copies from the originals.

These pictures form a gold standard which Rajkovic and Milovanovic use to test their ideas. Their fundamental hypothesis is 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.

But how to tell the difference? Rajkovic and Milovanovic contend that this is possible using wavelet analysis that transforms a two-dimensional image into a time-frequency representation which captures information about the painting at various scales. These scales can be thought of as looking at progressively more blurred images of the paintings.

Rajkovic and Milovanovic perform this analysis using the red, green, and blue channels of a conventional RGB image of each painting. and they repeat the analysis for patches of each painting.

Sure enough, they say a difference in complexity is clearly visible between Caspers's originals and copies. "For all patches and all the paintings, the mean global complexity of an original painting is larger than the corresponding value of a copy," they say.

Rajkovic and Milovanovic go on to apply the same technique to both versions Magritte's *The Flavour of Tears*. Their analysis certainly reveals a higher level of complexity, as they define it, in one of the paintings.

They say the results are indisputable. "We claim with utmost confidence, that only one of them is the result of self regulatory creative work," they say. "The other is a copy by the original artist."

That's an exciting conclusio, but there is a sting in the tail. Rajkovic and Milovanovic are playing their own game here. They identify the paintings as *The Flavour of Tears 1* and *The Flavour of Tears 2* and say the first is clearly the original.

However, they don't say whether this is the one hanging in Birmingham or in Brussels. If their numbering is consistent with the way they introduce the paintings, then Birmingham is the owner of the original.

But Rajkovic and Milovanovic are not clear on this point—perhaps in homage to Magritte, perhaps to avoid controversy, perhaps to give themselves wriggle room should other evidence emerge that challenges their conclusion. Who knows!

So let's challenge them here. If they really are confident in the conclusion, let them reveal it clearly. We'll be interested to know, as no doubt will be the owners of the paintings.

Ref: arxiv.org/abs/1506.04356 : The Artists Who Forged Themselves: Detecting Creativity in Art