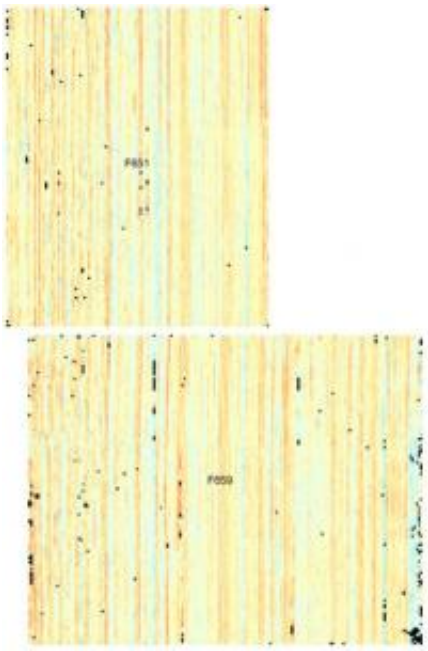
Professor's algorithms unlock Van Gogh mysteries

March 31 2011, By Anne Ju



Richard Johnson has created weave density maps of the canvas threads in Vincent Van Gogh paintings to help authenticate and date the works of art. Painting F651, "Falling Leaves," matches the thread pattern of F659, "Garden of the Asylum," providing evidence that the canvases came from the same roll.

(PhysOrg.com) -- A Cornell electrical engineering professor is helping art historians do a little detective work by using computing algorithms to identify which of Vincent Van Gogh's paintings came from the same original rolls of canvas.

C. Richard Johnson Jr., the Geoffrey S.M. Hedrick Senior Professor of Engineering, is on leave from Cornell this semester to serve as an adjunct research fellow at the Van Gogh Museum and other museums in the Netherlands. Computer algorithms are allowing Johnson and colleagues to count the number of individual threads per centimeter in the canvases Van Gogh painted on -- tasks that would take multiple lifetimes to complete by hand.

"There is a long tradition of interaction between scientists and museums in the materials science area, but what's not been done so much is this kind of image processing and analysis that can be done by the computer," said Johnson, whose academic expertise is in signal processing, which he has long wanted to mix with his Ph.D. minor in art history.

To analyze the paintings, researchers first X-ray them to unveil the thread patterns from beneath layers of opaque white primer. These images are then fed into the computer so individual weave densities can be calculated.

"Garden of the Asylum" by Van Gogh

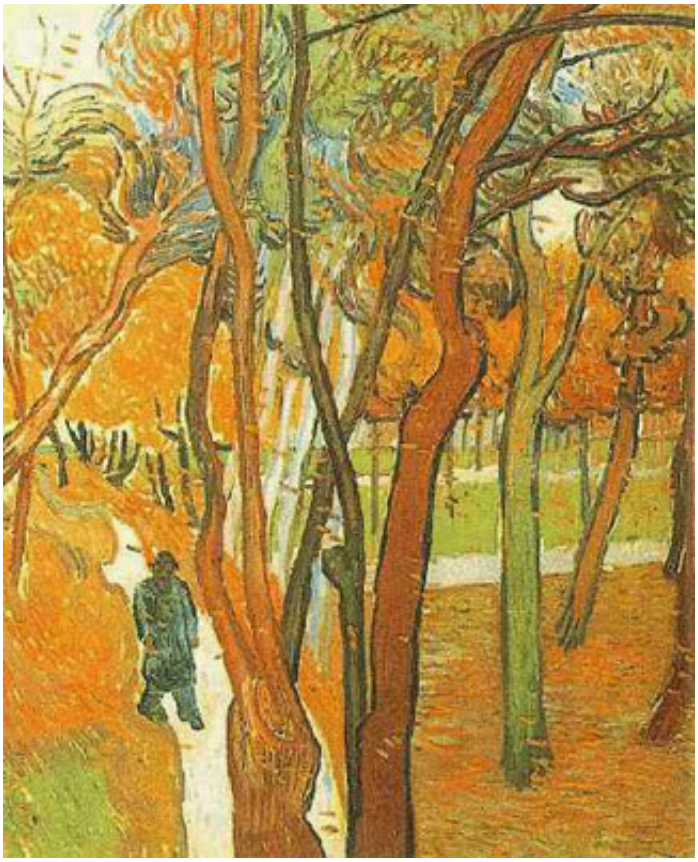
These canvas "weave maps" plot the average thread count of either horizontally or vertically oriented threads, represented by colors. Matching patterns allows observers to quickly determine whether paintings came from the same roll of canvas, giving historians a clearer view of the order in which Van Gogh painted his most famous works.

"This is pretty extraordinary," Johnson said. "What's happening is some doubted paintings are being authenticated, and some that had been placed at a funny date are now being moved."

When Johnson began working with the Van Gogh Museum in 2007, he knew he wanted to use signal processing to help art conservators; he just wasn't sure exactly how. Much of his early work involved fraud detection -- using computers to identify fakes -- a "sexy" topic, he says, from which he's been wanting to branch out.

Now, as the Van Gogh Museum readies an exhibition years in the making on the methods, practice and technique of Van Gogh, Johnson's technical expertise will have played a significant role.

Johnson and collaborators Don Johnson of Rice University and Rob Erdmann of the University of Arizona have counted the threads in all 320 Van Goghs owned by the Van Gogh Museum, and more than two dozen other museums -- approximately 60 percent of all those in museums worldwide. The ones in private collections are a trickier matter, Johnson said, but he's hoping more collectors will come forward so engineers can account for the threads in every Van Gogh painting in the world.



Van Gogh's "Falling Leaves"

These types of technologies could continue revolutionizing people's understanding of how artists worked, Johnson said. For example, he and his colleagues are also looking at how the canvases were mounted onto various frames during their preparation and use. Using similar image-processing techniques to look at the scalloped patterns at the edges of the paintings, they can help identify whether the paintings were cut down at some point in time. This could help art historians piece together missing clues about lost works or provide a clearer understanding of the artist's original intentions.

Johnson hopes to persuade art conservators and technical art historians to buy into these technologies as a way to enhance their professional capabilities.

Provided by Cornell University