Disney researchers create computer models that capture style and process of portrait artists

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By monitoring artists as they sketch human faces, stroke by stroke, scientists at Disney Research, Pittsburgh, have built computer models that learn each artist's drawing style, how they use strokes and how they select features to highlight as they interpret a face into a portrait.

A better understanding of this abstraction process, the researchers stated, not only is interesting from an artistic point of view, but also can help in developing artificial drawing tools.

"There's something about an artist's interpretation of a subject that people find compelling," said Moshe Mahler, a digital artist at Disney Research, Pittsburgh. "We're trying to capture that – to create a computer model of it – in a way that no one has done before."

Mahler, along with Itamar Berger and Ariel Shamir of the Interdisciplinary Center Herzliya, Israel, will present the findings at ACM SIGGRAPH 2013, the International Conference on Computer Graphics and Interactive Techniques, July 21-25 in Anaheim, Calif. Jessica Hodgins, Vice President of Disney Research, and Elizabeth Carter, a Disney Research, Pittsburgh associate, also were part of the research team.

Other computer programs can create line drawings from photos and some can mimic certain stroke styles. The Disney Research, Pittsburgh

approach, by contrast, is built on a database representing abstractions of a set of artists.

To create the database, the researchers recruited seven artists. Each sketched portraits based on 24 photographs of male and female faces using a stylus pen that enabled the researchers to record each stroke. The artists created four sketches of each photo, with decreasing time intervals allowed for each – 270, 90, 30 and 15 seconds. The result was a dataset of 672 sketches at four abstraction levels.

The dataset contains about 8,000 strokes for each artist, with each stroke categorized as shading strokes or contour strokes, with contour strokes subdivided into complex and simple strokes.

"Watching these strokes accumulate was an interesting part of this project," Berger said. Some artists started with the eyes, others with the outlines of the face. One of the artists had no discernible pattern, starting "wherever."

The analysis did not only focus on strokes style but also on the geometric interpretation of the face by the artist and how it is conveyed in the drawing. For instance, one artist consistently spaced eyes closer together in the sketches than they appear in reality, while another tended to draw wide jaws. Identifying these tendencies may help artists correct bad habits, Shamir said, though in other cases these variations may simply be recognized as artistic tendencies or style.

The researchers also used their system to synthesize sketches based on new face photos. In a perceptual study, test subjects were then asked to match sketches based on style, to match synthesized sketches with those of the actual artist and to try to identify which sketches were real and which were synthesized. The results demonstrated that the sketch generation method produced multiple, distinct styles that are similar to

hand-drawn sketches.

What the program can't do, Mahler emphasized, is replicate the spontaneity of an artist and their ability to balance the drawing as they work. "Our approach only understands the trends of how an artist might work," he added. And, because all of the artists based their work on photos, even the hand-drawn sketches were more constrained and reflected less personality than would have been the case if based on living, breathing subjects.

Future work could extend these techniques to subjects beyond faces or people, to other drawing techniques and might also include time-based animation, Shamir said.

Provided by Disney Research

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