Capturing moving subjects in still-life quality

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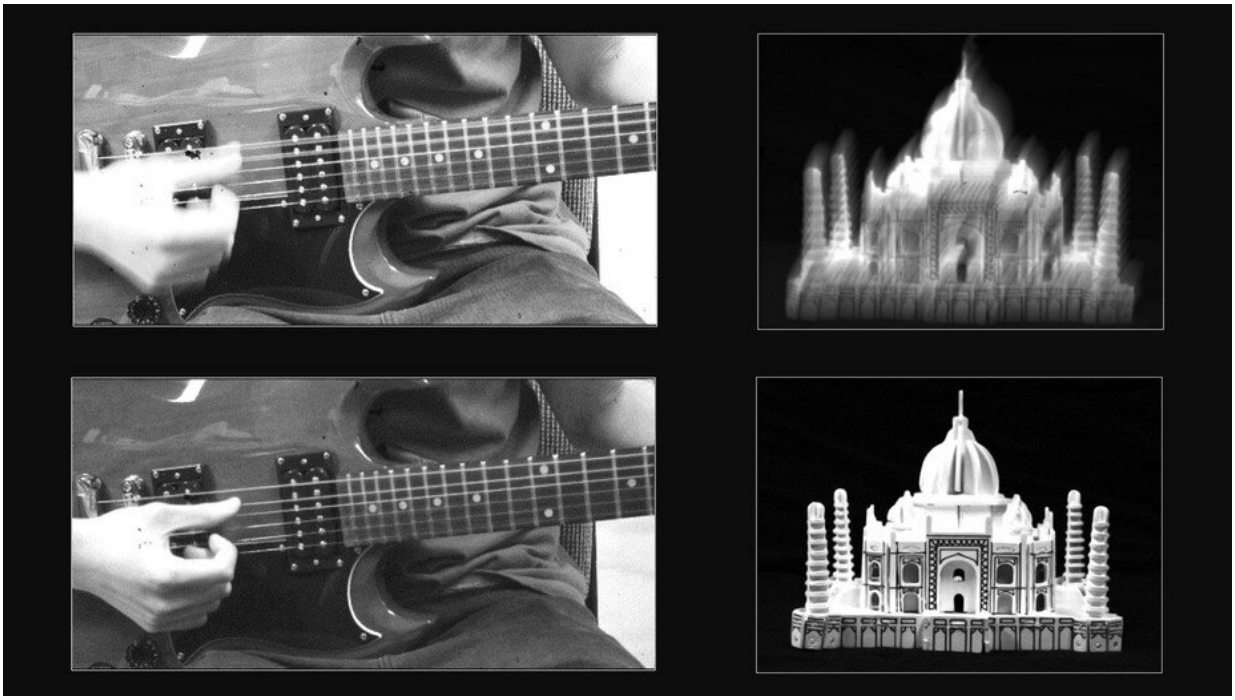

Credit: Ecole Polytechnique Federale de Lausanne

Researchers at EPFL's Advanced Quantum Architecture Laboratory and the Wision Laboratory at the University of Wisconsin-Madison have developed a technique for building crystal-clear images of moving subjects. The team will present its paper at the prestigious SIGGRAPH 2020 conference in August.

In 2019, Edoardo Charbon, a professor at EPFL's School of Engineering

(STI), was attending a workshop in Canada. It was there that he met Mohit Gupta, a fellow professor at the University of Wisconsin-Madison. "Mohit is an expert in computational photography," says Charbon. "He asked if he could borrow our SwissSPAD camera for an experiment. That's where it all started."

A novel approach

Gupta wanted to see if he could take a photograph of a moving subject in still-life quality. The SwissSPAD imaging device was just the piece of equipment he needed for his experiment. The camera, which generates two-dimensional binary images at a resolution of 512 x 512 pixels, is able to capture single photons—the smallest measurable unit of light. For Charbon, it was a novel approach. "I didn't think our camera was capable of what Gupta was proposing," he says. "But the science proved otherwise."

Adding depth and color

The camera's high pixel resolution and ultra-fast frame rate allowed the scientists to build a still image of their moving subject. "SwissSPAD captures 100,000 binary images—while detecting photons or not—per second," explains Charbon. "We can use an algorithm to correct for variations." Using this technique, they were able to build a high-definition image of their moving subject. "We took thousands of photographs and combined them to create just one image."

The team's next challenge is to run the experiment again with the MegaX camera. "MegaX is similar to SwissSPAD in many ways; it's also a depth-sensing camera, thus it can generate 3-D images," says Charbon, who also plans to introduce color at pixel level very soon.

This August the scientists will present their findings at SIGGRAPH, a highly respected annual conference on computer graphics. From a field of over 160 entries, their research has been selected as one of six highlights of the Technical Papers program.

Provided by Ecole Polytechnique Federale de Lausanne