New technologies aim to make 3-D cameras easier to use

March 25 2020, by Chris Adam

On the right is a 3D image with auto-exposure control. A Purdue University team has created technology to make 3D cameras easier to use. Credit: Song Zhang/Purdue University

A 3-D camera should be as easy to use as one found on a smartphone.

That is the guiding principle for a Purdue University professor with more than two decades of experience in the 3-D imaging field, who has developed new technologies aimed at making 3-D cameras easier to use.

Song Zhang, a professor of mechanical engineering in Purdue's College of Engineering, led a team to create technologies to help compress 3-D camera files and automate focus and exposure settings.

"We have come a long way with high-end 3-D camera technology," Zhang said. "But using the technology still almost always requires a great deal of training. We want to create technologies to make 3-D cameras easier to use for everyone from tourists to doctors to video producers."

To obtain the best image with current high-end 3-D cameras based on structured light technique, the manufacturer must conduct precise projector and camera focal length and other parameters calibration, and the user must manually adjust the optimal sensor exposure time. This leads to a training requirement for a user to properly operate the camera, and often involves complicated recalibration processes by the manufacturer if the camera is accidentally disturbed.

Zhang's team has automated the process of profilometry by developing algorithms to rapidly determine the optimal exposure after understanding the intrinsic constant response function of the sensor. The researchers also devised a method of generating highly accurate 3-D images using an autofocusing feature on electronically tunable lenses.

"I believe 3-D camera technology has the ability to have an even greater impact on the field than 2-D camera technology ever has, assuming it is easy enough for users," Zhang said.

More information: Xiaowei Hu et al, Autofocusing method for high-resolution three-dimensional profilometry, *Optics Letters* (2019). DOI: 10.1364/OL.382431

Provided by Purdue University