NASA Langley Research Center
Center Innovation Fund

Spaceflight Videogrammetry On The Cheap

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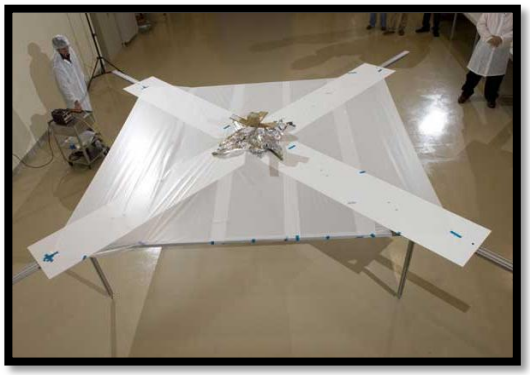
As NASA researchers develop vehicle prototypes, they collect important data about how well the prototype performs during testing. Often this is done through a photogrammetry or videogrammetry system where sensors are attached to the prototype. A camera tracks the sensors, and the resulting data can be analyzed to refine the design and enhance the performance.

Although engineers at NASA Langley Research Center would like to use videogrammetry methods to collect measurements on solar sails and other thin material concepts, they face a challenge.



Solar sail material 1/16 thickness of a human hair

According to Dr. Justin Littell, “you cannot put these markers on solar sails, because the sail is so thin that if you attach something, you fundamentally change how the sail behaves.”

Littell and others in his group who work at the Center’s Landing and Impact Research Facility decided to try something quite novel and inexpensive.

Through a Langley Center Innovation Fund award, Littell has created a low-cost videogrammetry system that incorporates hardware from the Microsoft Kinect sensor. The Kinect sensor is a popular motion-tracking sensor used to track player movement for the popular Microsoft Xbox 360 gaming system.

“The Xbox naturally came up. It uses its own projection of this dot field and then tracks its own projection, so you don’t have to do anything to it.”

The sensor measures depth, and the infrared camera is programmed to show a depth chart, basically coding the depth of field in all the objects in the field of view.

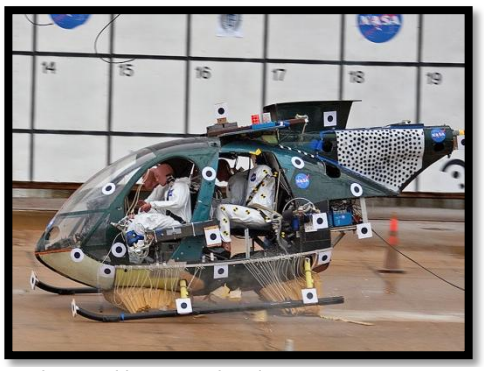
“With the depth information you have from this infrared camera, along with the video, you can get depth data in respect to time, which will give you things like deformation and motion and velocity and acceleration,” says Littell.

By using Microsoft Visual Basic software, he wrote a program that takes the data from the sensor and translates into a suitable version for his analysis. Eventually, however, he plans incorporate an engineering software program into the system to improve the post-processing of the data.

“What we have today so far is the sensor working with the computer. It’s able to display all the depth data. It’s able to display the motion of anything we put in the field of view. We’ve tested a lot of the environmental concerns, and I have coded a lot of the program already but we want to do with a solar sail in a vacuum chamber.”

Since beginning the project, Littell has had other ideas for using the system.

“The sensor itself doesn’t distinguish between a live person and a crash test dummy. What we’re thinking about is placing some of these sensors on board some of our aircraft or crash tests and see if we can track the motion of these dummies as they undergo some type of impact event.



Crash test with conventional sensors

We could do this with conventional methods but I thought we have this technology, we might as well use it and see what we get.”