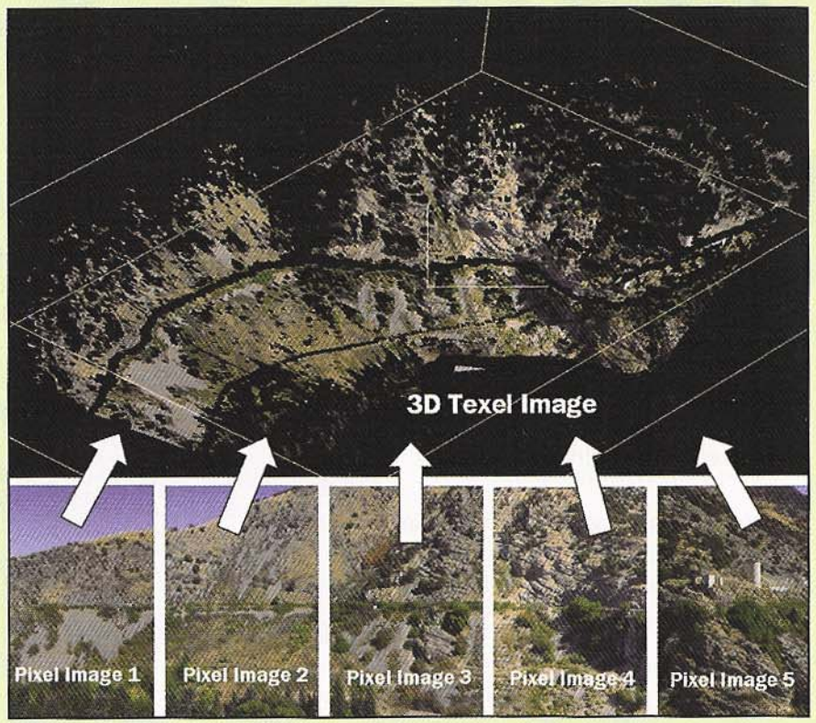
3-D Multispectral Imaging Cameras Go Airborne

Ladar imaging produces instant feedback.

Attaching a camera to the end of a missile to help guide the missile to a target might sound a little like science fiction. However, researchers at Utah State University and Lidar Pacific Corp., both in Logan, Utah, have received a patent for an imaging technology that could send the world of reconnaissance in exactly this direction.

Using 3-D Texel Camera technology, an image is transformed into "texels" in real time. Texels are texture elements used in computer graphics that are obtained from texture memory and that represent the color to be applied to a corresponding fragment, as opposed to pixels, which are picture elements that make up a computer image. Then, using imaging ladar, sensors within the camera show the 3-D image as if it were painted on a wire-frame object.



The pixels of five ordinary 2-D images at the bottom are equivalent to the single 3-D texel image at the top. The texel image is computer-manipulated to produce a 3-D perspective of a 1000-foot-high canyon wall just above the Utah State University campus. Even though this texel image was taken from the ground (same perspective as the 2-D images), the canal traversing the mountainside can be seen as if the picture were taken from the air.

Although commercial software that will take camera images, scan them with ladar and then merge the two does exist, this new process is seamless, according to co-inventor Robert T. Pack. An engineer in the College of Engineering at Utah State and at the Space Dynamics Laboratory, he began researching this new technology eight years ago. He believes that what sets it apart at this point is that it is 3-D imaging technology that works in moving, dynamic environments. Pack explained that, when placed at the end of a missile, the system autonomously feeds back the results of the scene interrogation.

The camera can provide information in two ways: in relative coordinates, where multiple images are put together through point-cloud matching, or in geo-coordinates, where the merging is automatic. Relative coordinates often are good enough for ground-based applications such as surveillance, but airborne work requires geo-referenced 3-D image information, which is processed by a computer to discover the coordinates of the target. The camera can take the image and produce the information in milliseconds, according to Pack.

The greatest challenge right now, he said, is matching hardware components with the overall system requirements. The group is actively engaged in seeking partners who can produce the individual components for the texel cameras.

The Utah researchers are working with the Space Dynamics Laboratory on the reconnaissance application. Other potential areas for commercialization include surveying for land, forestry, mining and utility companies; city modeling and urban mapping; cinematography; 3-D gaming; and security.

The university has formed the Utah Center for Advanced Imaging Ladar to help bring this technology to market. □

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