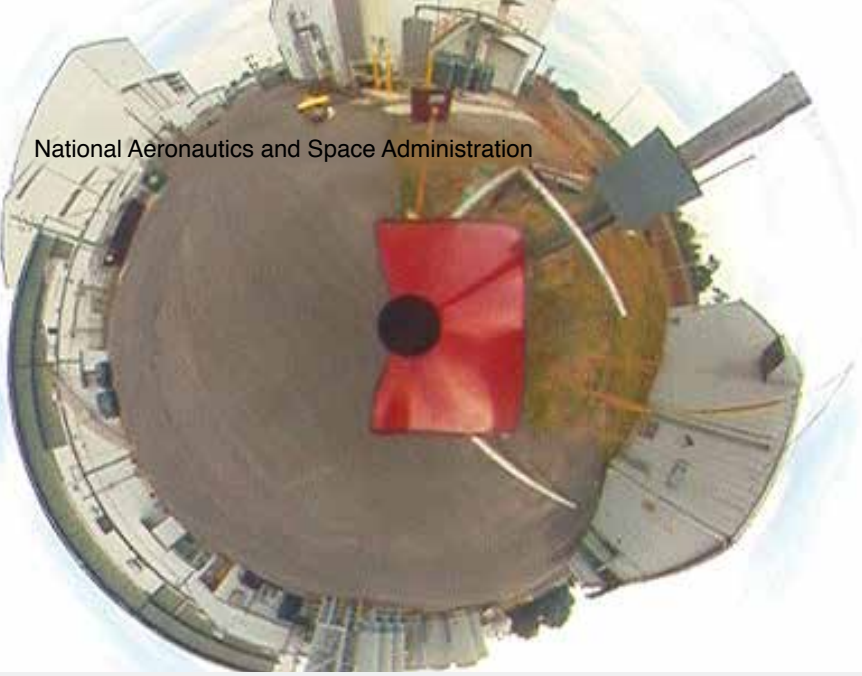

National Aeronautics and Space Administration

technology solution

Optics

New Optics See More with Less

NASA offers companies an optical system that provides a unique panoramic perspective with a single camera.

NASA's Marshall Space Flight Center has developed a technology that combines a panoramic refracting optic (PRO) lense with a unique detection system to acquire a true 360-degree field of view. Although current imaging systems can acquire panoramic images, they must use up to five cameras to obtain the full field of view. MSFC's technology obtains its panoramic images from one vantage point.

BENEFITS

- **Full 360-degree field of view**—This technology provides a radial image of the entire surrounding environment, from which any angle or image segment can be extracted and displayed horizontally.
- **Single-camera system**—This technology captures a panoramic view with a single camera; traditional panoramic systems need between two and five cameras.
- **Small size and low weight**—The lense can
- be made 1 inch in diameter and 1 inch wide (or smaller) and made of lightweight plastic and glass.
- **Relatively low cost**—Using simple lathing or injection molding processes, the PRO lense can be manufactured from low-cost plastic or glass.

THE TECHNOLOGY

This technology emerged from NASA's advanced optics research for space applications. Unlike fish-eye lenses, which use refraction to produce a 190-degree image field, NASA Marshall Space Flight Center's panoramic reflecting optic lense uses both refraction and internal reflection to provide a unique annular (i.e., radial) 360-degree image field of view. The PRO lense can be shaped to view a small or large angular range of the entire region that surrounds the optical axis of the lense. The lense's production process involves simple lathing or injection molding of a glass or acrylic plastic. The simple manufacturing process enables low-cost production of MSFC's optical system.

The ability of the system to acquire the 360-degree imaging information from a single vantage point is an important feature for many applications. For example, a PRO-equipped camera mounted on top of a vehicle could simultaneously view the entire surrounding area, providing optical information without blind spots. This image information could be archived so that dynamic incidents could be accurately reconstructed. In security systems, a single inexpensive camera could monitor, detect, and record movement around a large physical area, such as a parking lot or building grounds.

APPLICATIONS

In combination with a standard camera, this technology offers a "visual radar" system for transportation equipment, security systems, and monitoring devices. The unique 360-degree field of view can benefit a variety of applications:

- Security/surveillance
- Collision detection and safety alerts
- Driver assistance
- Monitoring and detection

PUBLICATIONS

U.S. Patent No. 6,580,567

More Information

National Aeronautics and Space Administration

Sammy A. Nabors

Marshall Space Flight Center

Huntsville, AL 35812
256.544.5226
sammy.nabors@nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2014-12-XXXX-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

MFS-31475-2-DIV, MFS-31475-1