NASAfacts

Space Technology
Game Changing Development
High Dynamic Range Stereo X (HiDyRS-X)

Overview

The High Dynamic Range Stereo-X (HiDyRS-X) project is designing and building a state-of-the-art, high-speed video recording system using disruptive technologies based on emerging advances in the field of computational photography. The end goal will be a system that will provide quality, high-speed, three dimensional (3-D), high dynamic range (HDR) video for the SSC rocket engine test complex that will be extensible to other NASA priorities including launch monitoring and space-based rover and robotics missions. To date, no high-speed video cameras provide high dynamic range capabilities with one camera.

HiDyRS-X high-speed videography is essential for NASA's future deep space missions, for the development of propulsions systems and launching facilities, and for use on planetary rovers. This is due to the fact that high-speed, HDR imagery can help obtain critical data that are typically lost with traditional digital cameras due to saturation and the inability to offboard data. An application of high-speed, HDR video with 3-D capability is being developed to capture essential information for NASA during rocket engine flight certification ground testing.

Project Description

The HiDyRS-X project will design and build a novel, state-of-the-art, high-speed video recording system to provide 3-D HDR video for operational use on the SSC rocket engine test stands, which is "game changing" from a videography perspective. This is because HDR imaging acquires multiple images at different exposures and applies digital signal processing algorithms to recombine them into a single image that excludes over- and underexposed pixels to improve image quality. The result is an image with more detail than could be captured by a single exposure. HDR imaging effectively increases a camera's dynamic range and eliminates saturation.

Typically, HDR images are developed using multiple cameras or multiple exposure sequencing. The game changing approach implemented here is to create high-speed HDR video imagery utilizing a single camera without time sequencing.

Camera exposure will instead be controlled at the chip/pixel level and then integrated into a high-speed video camera. The resulting HDR capability will be easier to install and operate within the SSC test stands because the entire system will be contained within a single camera; this is a completely revolutionary and innovative means to generate HDR capability with high-speed video when compared with the labor-intensive steps associated with the careful alignment required when multiple cameras are used to generate similar imaging results.

Partnerships

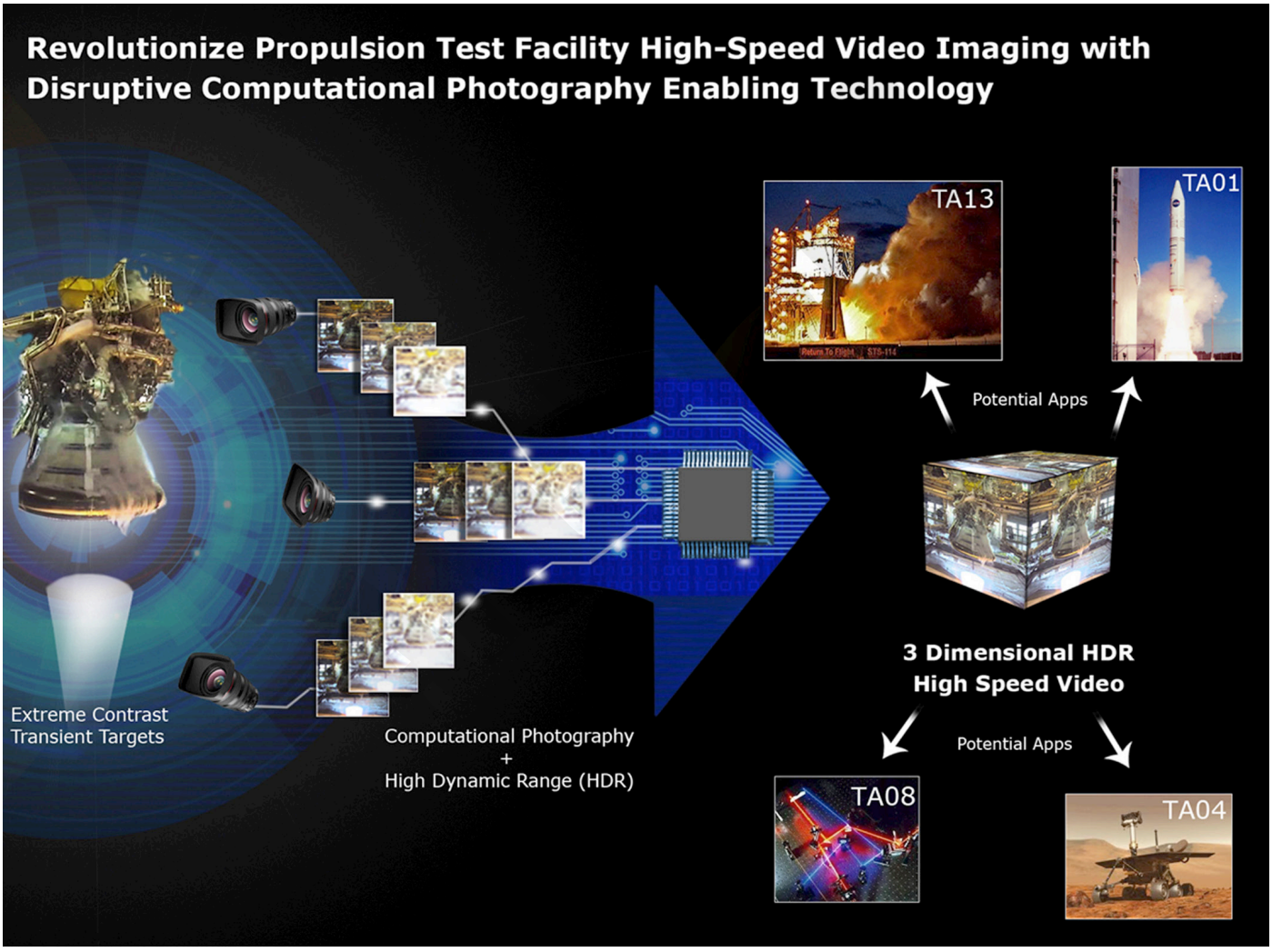
The HiDyRS-X project team is a collaboration between Stennis Space Center Early Career Employees and Innovative Imaging & Research Corp., who is providing expertise in imaging, optics, and working agile.

Principal Investigator

The principal investigator is Howard Conyers, NASA's Stennis Space Center.

The Game Changing Development (GCD) program investigates ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop technologies through component and subsystem testing on Earth to prepare them for future use in space. GCD is part of NASA's Space Technology Mission Directorate.

For more information about GCD, please visit http://gameon.nasa.gov



National Aeronautics and Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529

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