SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

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INNOVATIVE 3D IMAGING SYSTEM FOR SPACE APPLICATIONS

Abstract

The article will portray an innovative system that enables to convert commercially available cameras into a state of the art 3D imaging system – and in the near future could be used in a verity of space applications, from docking mechanisms of spacecraft, examination tool for observing the integrity of a space shuttle thermal insulation, space proximity operations to a 3D vision system for robotic exploration of the Moon and Mars, among many other applications.

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The Israeli based company Mantis Vision (MV) is currently developing products based on two of its core technologies: a 3D video imaging technology and a (2D) video stabilization algorithm for cameras using wide-angle lenses. The company is in the delivery phase of its first handheld 3D imager product (MVC) to its government customers and has started the identification phase of its next product.

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Mantis Vision solution is a patent-pending 3D imaging technology which is based on an active triangulation method in which a pattern (structured light) is projected onto the scene and captured by one or more video cameras. The code contained within the pattern is automatically decoded into a dense point cloud (hundreds of thousands) of accurate 3D distance measurements from each frame in the video which results in a highly accurate 3D movie capable of capturing people and objects in motion as well as reconstructing a model of stationary 3D environments. The core technology may be implemented using different light sources and components resulting in small, lightweight, modular, and customizable systems that can acquire dynamic scenes (e.g., moving people) while in motion with the ease of a conventional 2D video camera.

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The MVC 2.0 is a unique solution to this market's need for a hand held 3D imager capable of accurately (mm-scale) remodeling 3D objects and room-sized environments in total darkness. The MVC 2.0 product consists of two system components: a 3D imager and a software application (MVP) to process and visualize the 3D data. The videos are downloaded to a PC (laptop, or a desktop) where MVP de codes each of the frames in the video into a dense point cloud of 3D distance measurements (80,000 samples per frame). Special emphasis was given to requirements addressing the product's ease-of-use and robustness, resulting in a system that is easily operated by non-experts, that is almost fully automatic, and that does not require any preparation of the imaged scene. We believe that this unique 3D imaging system can and will be used for the benefit of various space applications.