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# Space Environment Robot Vision System

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A prototype twin-camera stereo vision system for autonomous robots has been developed at Goddard Space Flight Center. Standard CCD imagers are interfaced with commercial frame buffers and direct memory access to a computer. The overlapping portions of the images are analyzed using photogrammetric techniques to obtain information about the position and orientation of objects in the scene.

The camera head consists of two $510 \times 492 \times 8$-bit CCD cameras mounted on individually adjustable mounts. The 16-mm efl lenses are designed for minimum geometric distortion. The cameras can be rotated in the pitch, roll, and yaw (pan angle) directions with respect to their optical axes.

Calibration routines have been developed which automatically determine the lens focal lengths and pan angle between the two cameras. The calibration utilizes observations of a calibration structure with known geometry. Test results show the precision attainable is $\pm 0.8$ mm in range at 2 m distance using a camera separation of 171 mm.

To demonstrate a task needed on Space Station Freedom, a target structure with a movable "I" beam was built. The camera head can autonomously direct actuators to "dock" the I-beam to another one so that they could be bolted together.