1) RS03

2) Sensors, Systems, and Next Generation Satellites VII, Hiroyuki Fujisada

3) Mars Exploration Rover Engineering Cameras

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5) Oral Presentation

6) Abstract text:

NASA will send two identical scientific rovers to different locations on MARS in 2003. The Rovers will each have a mass of ~150 kg and they will operate 90 days at the surface

of Mars. During this period of time, they will travel as much as 1 km. The primary scientific objective of the mission is to obtain knowledge of ancient water and climate on the red planet. The scientific instruments includes a stereo pair of panoramic cameras, and a Microscopic Imager

For navigation purposes (and to point the high gain antenna) the rover has additional 7 engineering cameras. All 10 cameras are similar except for the optics. The focal plane is a 1024 x 1024 pixel frame transfer CCD chip.

One engineering camera images the sun. The optics is 45 x 45 degree and it has a neutral density filter on 6.5 in front of the optics. This camera is used to point the high gain antenna and determine the north heading of the rover. One stereo pair of navigation cameras is mounted on a gimbal. The field of view is 45 degrees. This camera pair is used for traverse planning. Finally, a set of stereo hazard avoidance cameras is mounted on the front and on the back of rover. The stereo baseline is 10 cm and the field of view is 180 degrees diagonally. The rover uses these cameras to autonomously generate range maps of the surrounding area that are used for obstacle detection and avoidance.
This paper will describe the Hazard-, Navigation- and Sun-cameras. The paper will describe how the cameras are being used and it will give a technical description of the detector, optics, electronics, and calibration. Also qualification of the cameras will be discussed.

7) Key Words: Mars, Mars Exploration Rover, CCD camera, sun sensor

8) Brief Biography:

Allan Eisenman holds both bachelor and Master of Science degrees in electrical engineering from the University of California at Los Angeles. His extensive experience in aerospace engineering includes video display design, analog and digital circuit design, infrared systems engineering, spacecraft science imaging design, complex multi-functional visual and IR focal plane development, space borne video tracking systems, pioneering development of CCD star trackers for spacecraft, celestial sensor development and real sky characterization. Mr. Eisenman is employed at the Jet Propulsion Laboratory in Pasadena, California, as a Senior Staff engineer where he is engaged in the development of advanced celestial and target tracking sensors for Earth-orbiting and interplanetary spacecraft

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Many new remote sensing programs are under way throughout the world, specifically by U.S., European countries and Japan. NASA's Earth Science Enterprise (ESE) is executing a series of programs including EOS, Earth System Science Pathfinder (ESSP), and New Millennium Earth Observing flights and is planning for future systematic and exploratory measurements in addition to operational precursor missions. Japanese NASDA has a series of ADEOS and ALOS programs. ESA has ENVISAT and METOP programs. Each of these programs is developing a set of remote sensing systems to address their science objectives.

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