West Virginia University
College of Engineering and Mineral Resources

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DARPA Phoenix Program
College of Engineering and Mineral Resources
West Virginia University

The West Virginia University (WVU) College of Engineering and Mineral Resources (CEMR) is doing research to develop technology in support of space robotic operations. The R&D focuses on advanced sensor systems for operational feedback and machine vision algorithms for position estimation. The work involves faculty, graduate and undergraduate students from the departments of Mechanical & Aerospace Engineering and Computer Science & Electrical Engineering.

Custom Tactile / Force Sensor Arrays
WVU is fabricating custom tactile sensor arrays to implement with robotic tools and manipulators for force feedback. The ability to customize sensor arrays provides multiple solutions to specific sensor placement and their application. The sensor arrays and substrate materials are developed for operations at orbital temperatures and pressures.

3D Visualization with Blue Micro-Imager Arrays
Sensor arrays for imaging located on the local (tool) level are being developed. The arrays are composed of LEDs and photodetectors which provide local imaging for visual feedback during robotic tool operations. Applications of imager arrays include precision tool positioning, noncontact inspection and reconnaissance, and integration/embedment within tool mechanisms.

FEDALPE - Machine Vision Scheme
The FEDALPE (**F**eature **E**xtraction **D**etection & **L**abeling **P**ose **E**stimation) scheme was initially developed under Air Force funded research for autonomous refueling of unmanned aerial vehicles (UAVs). The scheme has been extended as a machine vision approach to target and position space assets in orbit. A particular advantage of FEDALPE is the ability to locate and track specific features without prior knowledge of the target geometry and dimensional specifications.

Chemical Leak Detection Sensors
WVU is working to develop custom-fabricated microsensor arrays to be applied for use in extreme environments for the detection of chemicals used in satellites. Research is being done on different types of sensing techniques. Detection techniques include temperature and chemical resistivity among additional approaches being developed. Fabricated sensors will be evaluated for performance under relative temperature and pressures experienced in orbit.

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