

## WVU Robotic Technology Center

### Technology for Space Servicing Applications



West Virginia University College of Engineering and Mineral Resources.

West Virginia University is a flagship land-grant, doctoral degree granting research university located in Morgantown, WV. WVU provides high quality programs of instruction at the undergraduate, graduate, and professional levels. WVU has received \$152 million annually in sponsored contracts and research grants and has an operational budget which is over \$875 million annually.

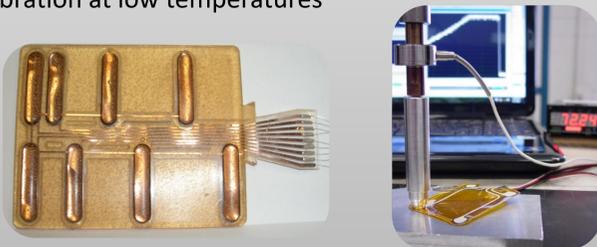
The WVU College of Engineering and Mineral Resources (CEMR) is nationally recognized for its educational and research programs, technical innovation, creation of knowledge, and ability to foster educational excellence, while continuing its commitment to the economic growth of the state and nation.

The work at WVU towards developing technology for space servicing applications involves faculty, graduate and undergraduate students from the departments of Mechanical & Aerospace Engineering and Computer Science & Electrical Engineering.

#### Custom Tactile / Force Sensor Arrays

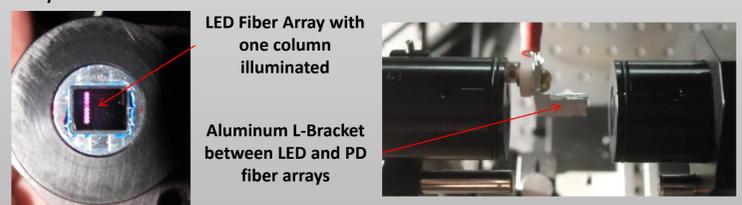
Force measurement is critical for precision robotic operations. WVU is developing and fabricating custom tactile sensor arrays suitable for orbital temperatures and pressures and optimized for specific servicing operations.

- Custom sensor arrays optimize positioning and applicability to specific tools
- Low temperature mechanical testing to validate space application performance
- Increasing performance of sensors to detect high frequency vibration at low temperatures



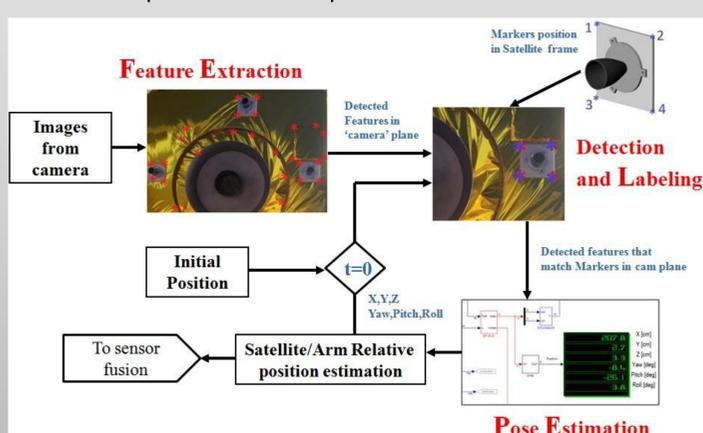
#### 3D Visualization with Blue Micro-Imager Arrays

- Develop sensor arrays consisting of LEDs, photodetectors and switching devices to be integrated with the robotic tool
- Initial prototypes use manufactured fiber optic arrays to test circuit and logic design
- Adapt a multi-view shape reconstruction algorithm to process acquired data for non-contact identification of target object
- Quantized output voltages are processed using the algorithm to construct a 3D representation from individually addressable array elements



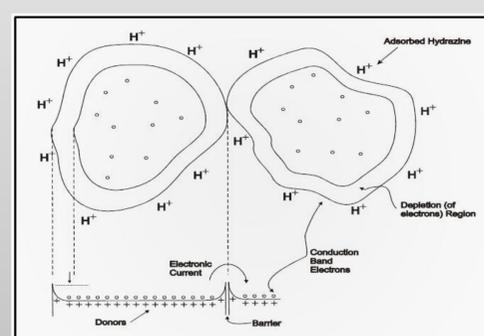
#### FEDALPE - Machine Vision Autonomous Approach of GEO Satellites

Leveraging previous Air Force funded research for autonomous refueling of UAVs, the FEDALPE scheme uses specific feature extraction techniques followed by detection and labeling of those features to output the relative pose estimation.



#### Chemical Leak Detection Sensors for Satellite Refueling Operations

Chemical sensors for detecting fuel leaks from satellites are being fabricated and currently evaluated at WVU. Such sensors may be useful for on-orbit refueling applications and fuel port evaluations.



Adsorption of reducing species (like  $N_2H_4$ ) on metal oxide surface causes reduction in current carriers which increases depletion area resulting in increase in resistance.

