

### Synopsis

- Cooperative Human Operations with Robot Teams (CoHORT) is inspired by the NASA JPL CADRE rover system
- Develop hardware and software of compact rover teams for autonomous exploration tasks
- Investigate human and robot team interaction

### Research Results and Products

- State estimation software development for unmanned ground vehicles combining visual and inertial odometry
- Stereo vision sensor integration for mapping and visual odometry
- Rover model integrated into simulation environment for performance and scalability testing metrics
- Multiple rover platforms for system field testing

### Commercialization and/or Societal Impact Opportunities

- **Application:** Automated guided vehicles (AGV), remote exploration and inspection
- **Key values:** Material transport with reduced human oversight, human robot teaming
- **Potential customers:** Warehouses, mining search and rescue, manufacturing

### Research Objective

- Research resilient system architecture design for scalable multi-robot teaming and autonomous task allocation
- Mechatronic design of compact rover hardware and electronics integration
- Software development integrating robot vision and state estimation for autonomous navigation

### Team Names & Collaborators

#### ARCS Students & Student Collaborators:

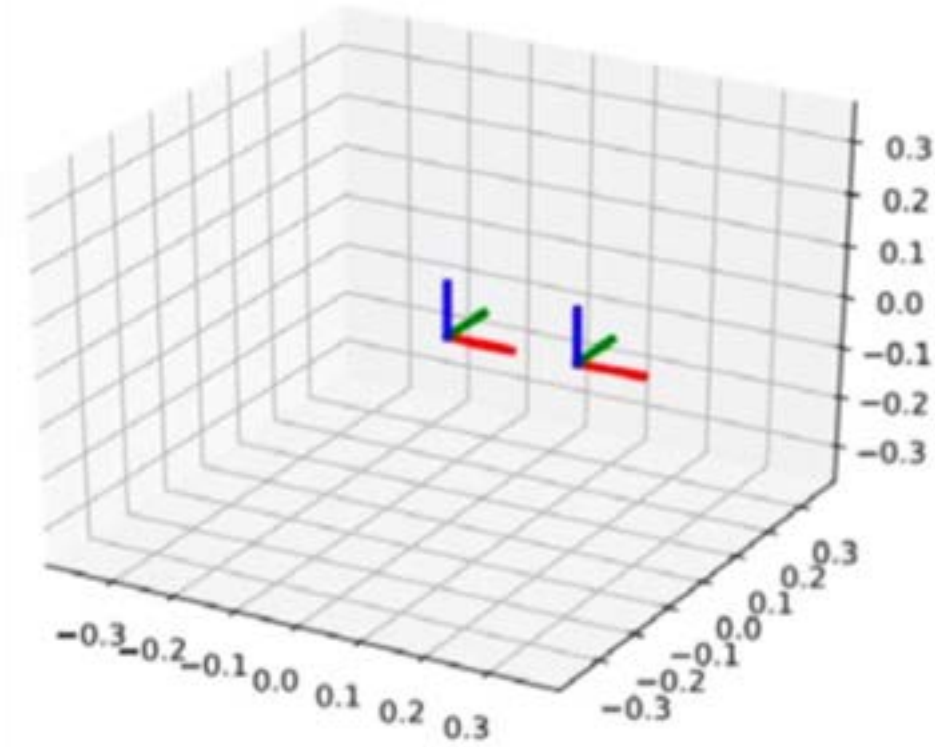
Hariet Yousefi, ME

#### ARCS Faculty & Staff:

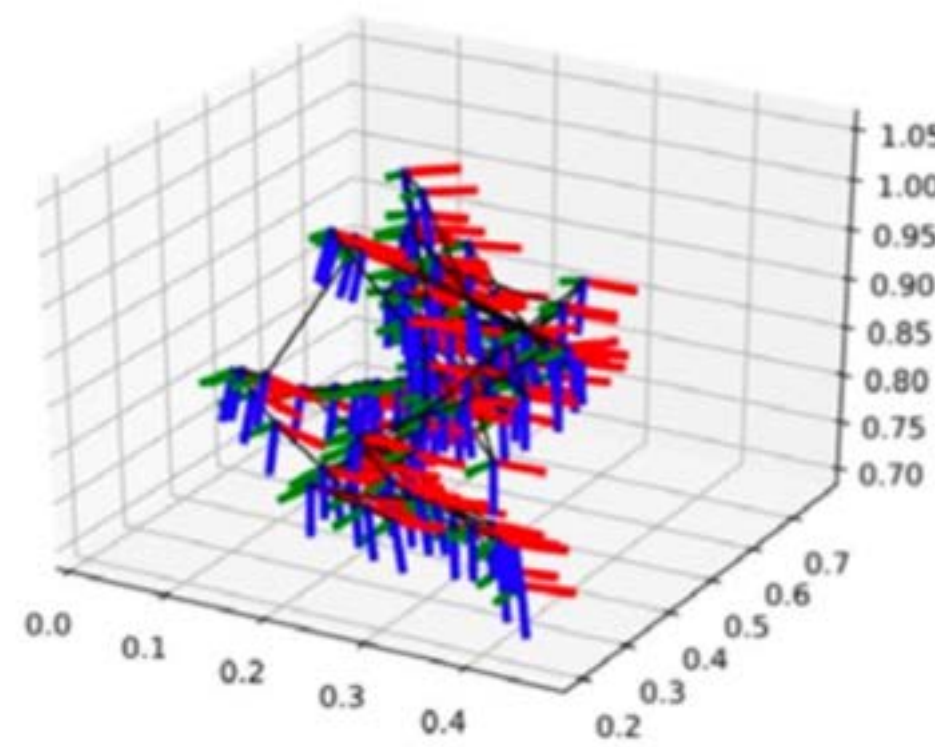
Prof. Amiel Hartman, ME; Dr. Barry Ridge, CS; Mr. Subhobrata Chakraborty, CS; Dr. Nhut Ho, ME

#### Collaborators:

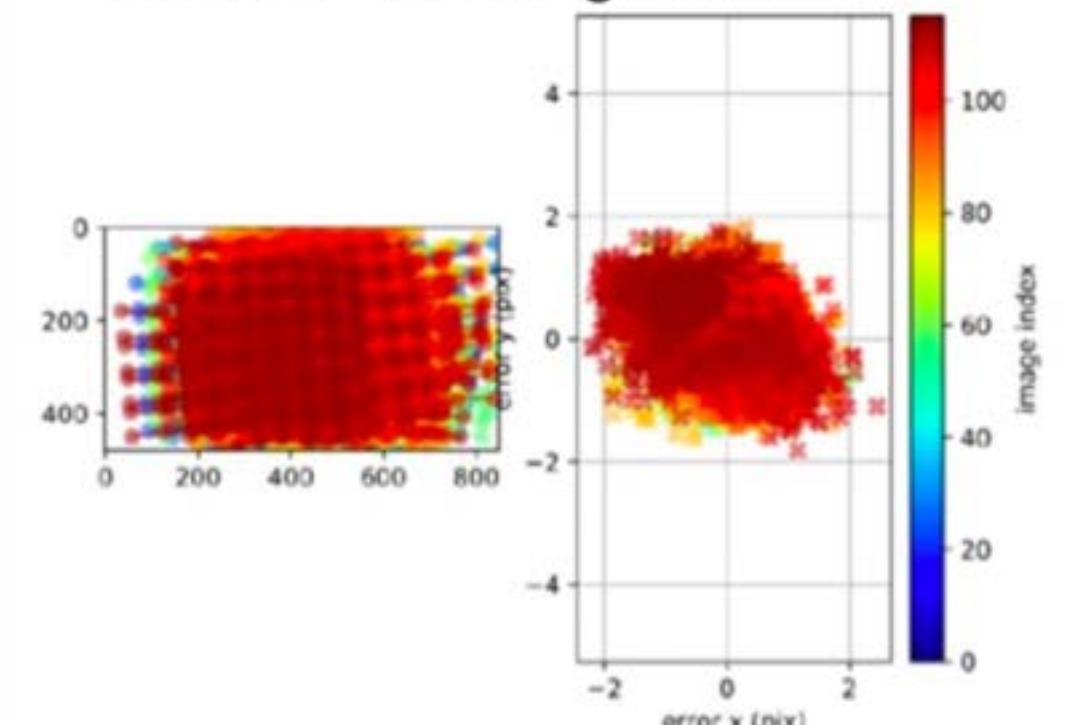
Dr. Jean-Pierre de la Croix, JPL



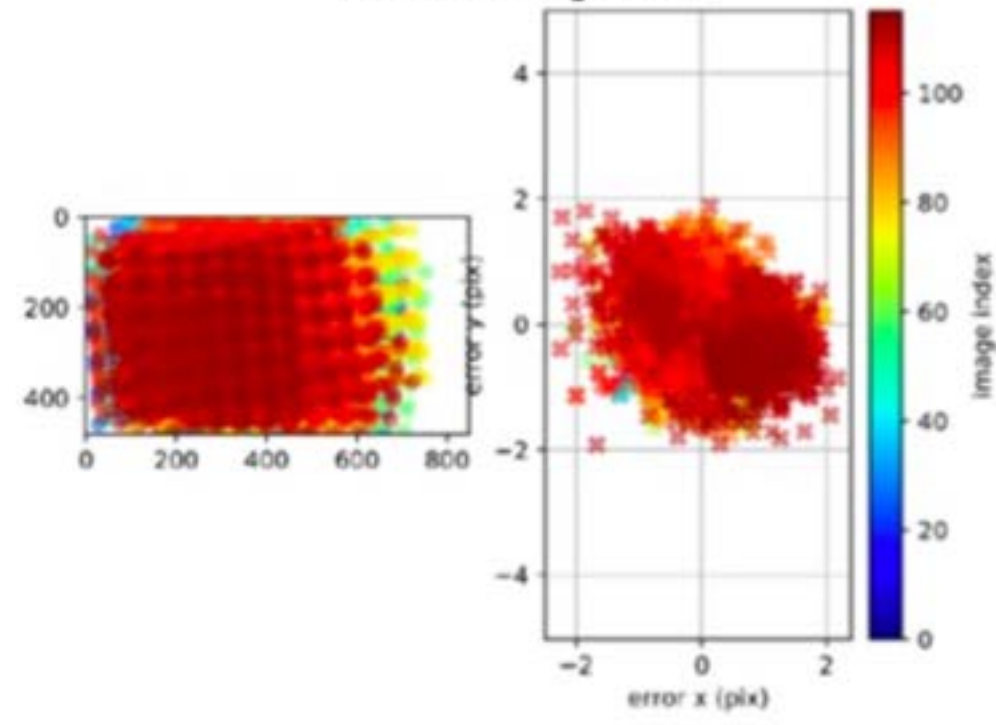
Stereo camera configuration



Estimated poses



Stereo camera system reprojection error



### Research Approach

- Collaborate with other robotics research projects at ARCS, including CAESARR, CART, and WATCHER for autonomous navigation software stack development
- Use software simulation environment for testing multi-robot autonomous navigation behavior and performance scalability of the system
- Field test state estimation and robot vision software on physical rover, followed by robot team autonomous navigation testing

### Citations

Chakraborty, S., Verma, A., Hartman, A., "Open VINS Based SLAM System for Real-Time Campus Tour Robot Navigation", 3rd IEEE International Conference on Computing and Machine Intelligence (ICMI 2024), Michigan, USA, April 13-14, 2024.