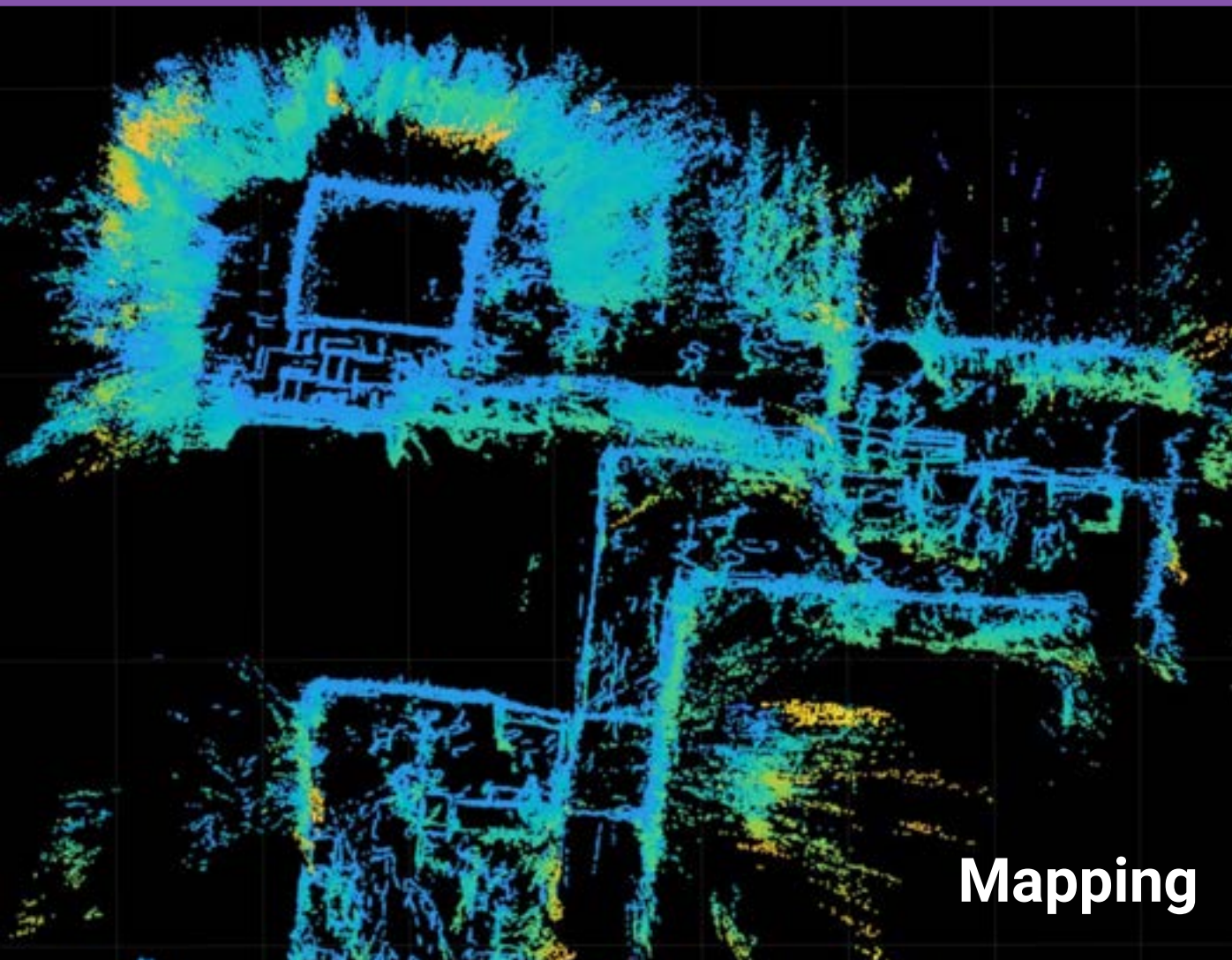




Trustable Autonomy



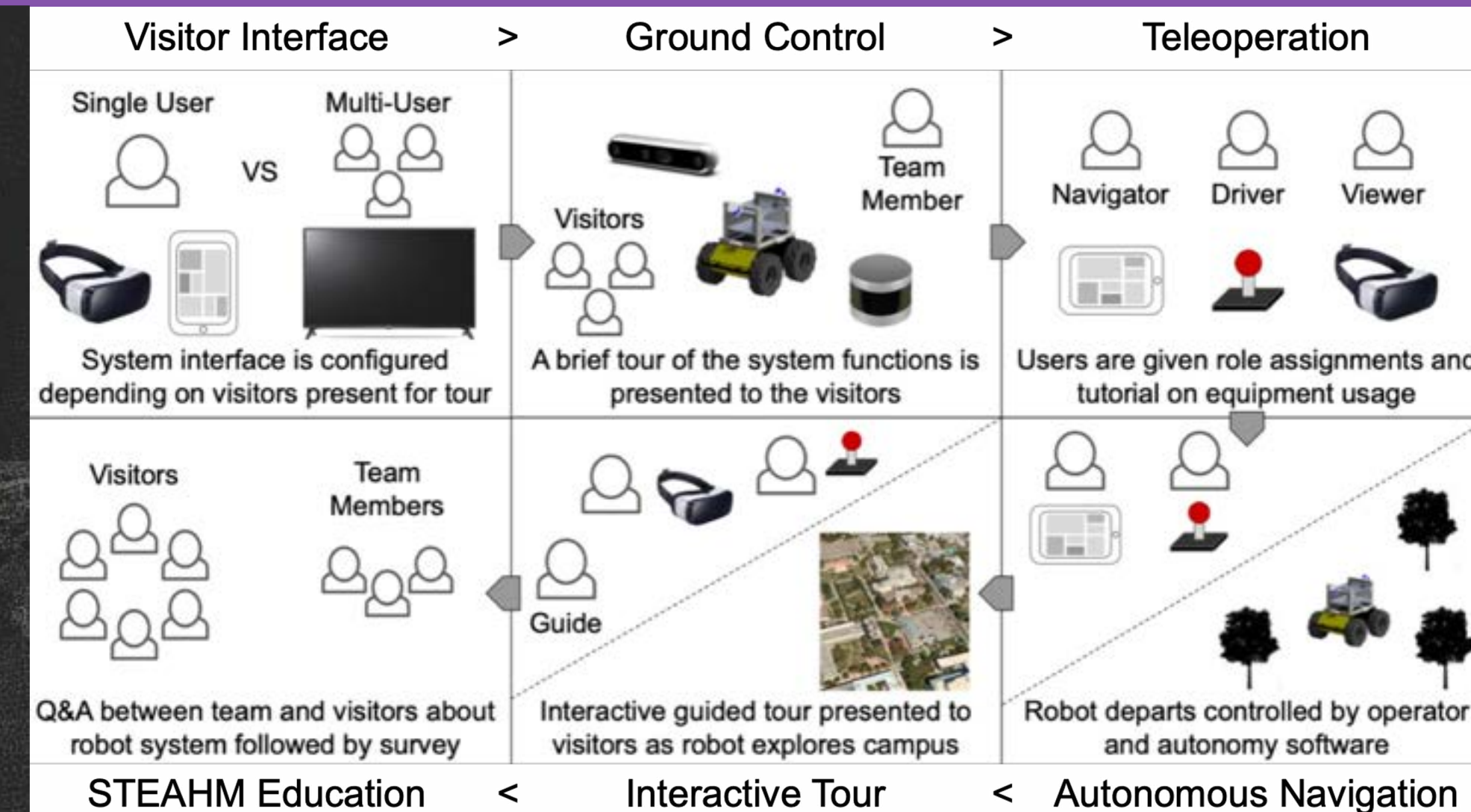
Mapping



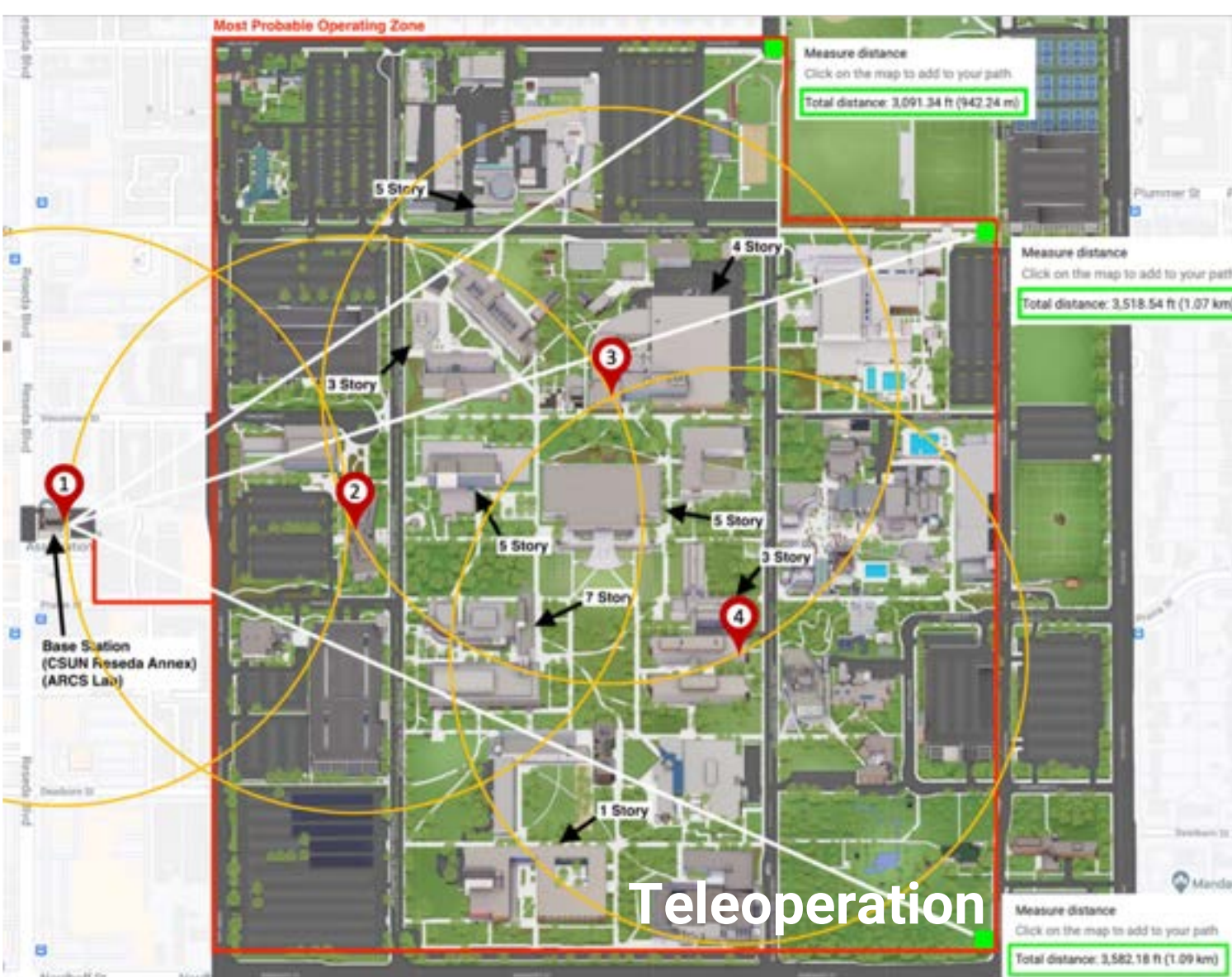
Mobility



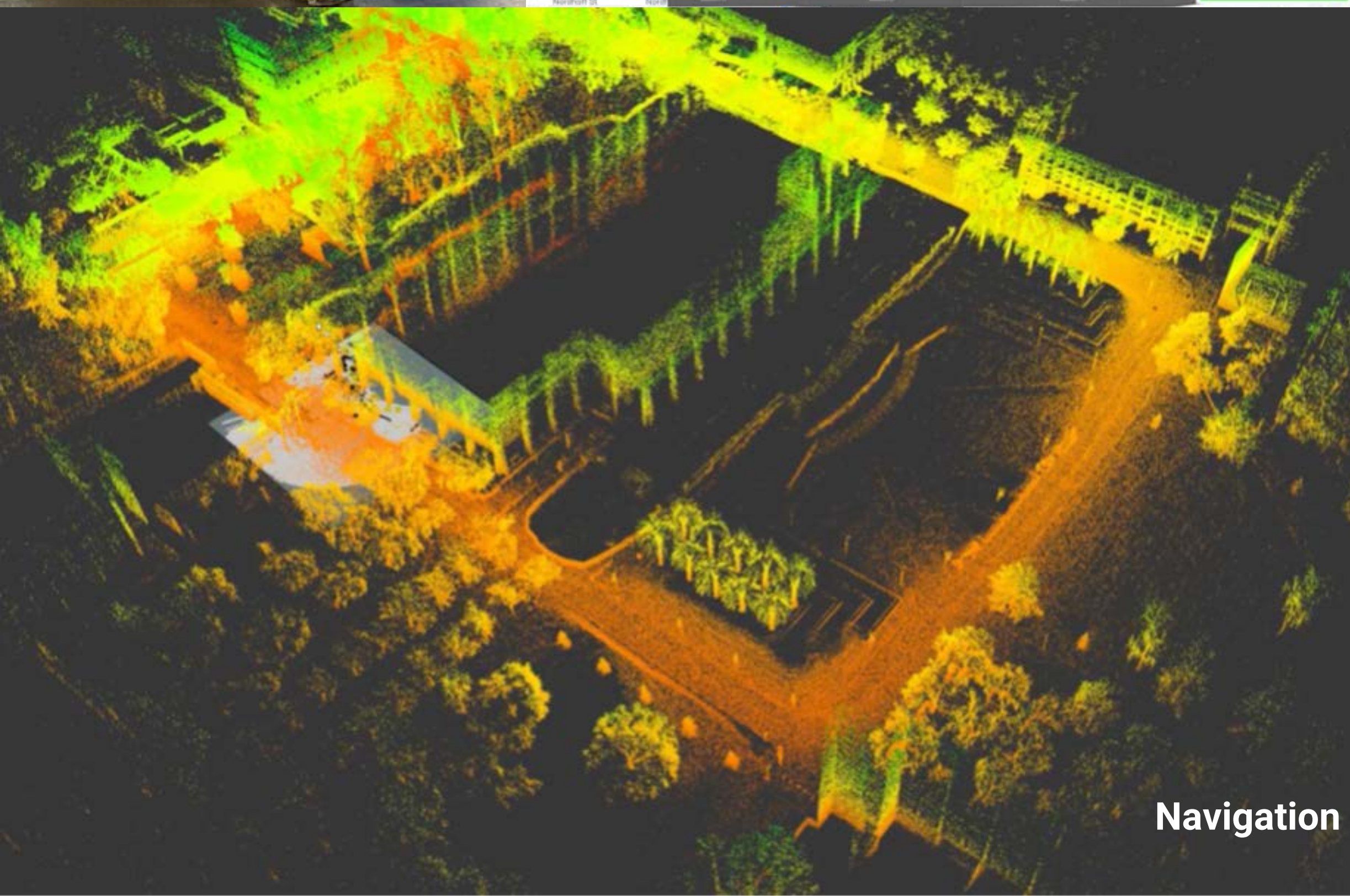
Robot Vision



Collaboration



Teleoperation



Navigation

Synopsis

- Develop an autonomous robot system that can deliver tours of the CSUN campus, inspired by NASA JPL NeBula compatible software framework, showcasing STEM technology to the campus and surrounding community.
- Integrate robot tours with University campus tours operations.
- Automate the tour process for in-person and virtual tours with robot interaction.

Research Objective

- Develop software infrastructure inspired from the autonomy framework developed by team CoSTAR for the DARPA Subterranean (SubT) Challenge.
- Mechatronic design of sensing and wireless communication system payload onboard an unmanned ground vehicle.
- Integrate robot perception sensor data into base station and user interface for remote operation at ARCS gallery space to enhance visitor interaction during virtual campus tours.

Research Approach

- Build software model of CSUN campus to test robot navigation and autonomy in simulated urban environments.
- Explore the interaction of GPS waypoint navigation with autonomous path planning and obstacle avoidance behavior to achieve safe operation during campus tour scenarios with human robot interaction.
- Field test sensor payload configurations and software for autonomous navigation on mobility platforms to enhance robot performance.

Research Results and Products

- Enhanced robot perception payload for mapping the environment
- Expanded user interface remote operation and virtual tour experience
- Mobility behavior improvements for human-robot interaction

Commercialization and/or Societal Impact Opportunities

- **Application:** Industrial inspection, remote exploration, tour guide
- **Key Values:** Automate operations with remote oversight and which require less onsite personnel
- **Potential Customers:** Manufacturing, museums, mining, search and rescue

Team Names & Collaborators

ARCS Students & Student Collaborators:

Harriet Yousefi ME; Shari Salas, ME

ARCS Faculty & Staff:

Prof. Amiel Hartman, ME

Subhobrata Chakraborty, CS

Dr. Nhut Ho, ME

Citations

Chakraborty, S., Verma, A., Hartman, A., "Novel LiDAR Based SLAM Systems for Real-Time Campus Tour Robot Navigation", 3rd IEEE International Conference on Computing and Machine Intelligence (ICMI 2024), Michigan, USA, April 13-14, 2024.
 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.
 Ginting, M. F., Hartman, A., Bucsa, N., Bracamontes, C., and Ho, N. T., "Campus Autonomous Robot Tours", Proceedings of the 2021 American Institute of Aeronautics and Astronautics ASCEND Conference (AIAA ASCEND 2021), Las Vegas, Nevada, November 15-17, 2021.

