

FIU

Applied Research
Center



DOE-FIU Cooperative Agreement Annual Research Review – FIU Year 3

Development of Long-Term Surveillance Unmanned Ground Vehicles (LTS-UGVs) for Nuclear Facility Surveillance

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*Worlds
Ahead*

Advancing the research and academic mission of Florida International University

Task Overview and Objectives

Site Needs:

- Continuous surveillance of nuclear facilities and repositories remains a critical need for the United States Department of Energy (DOE) to control and understand radiological environment impact, plan cleanup efforts, and meet QA objectives.
- Because of the nature of the facilities and radiological repositories, mobile systems provide a cost-effective and safe solution versus an in-situ network of sensors or manual routine measurements from site personnel.

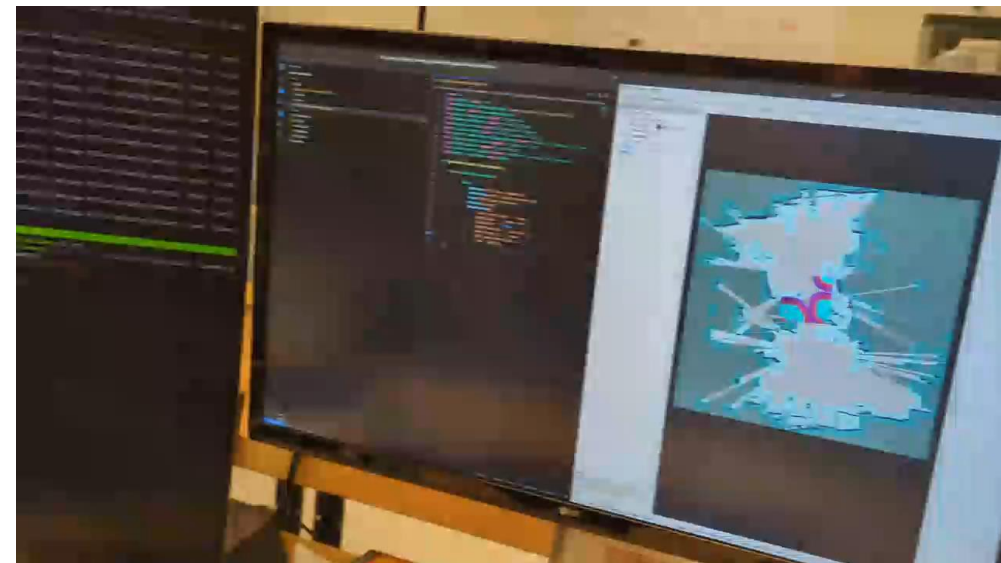
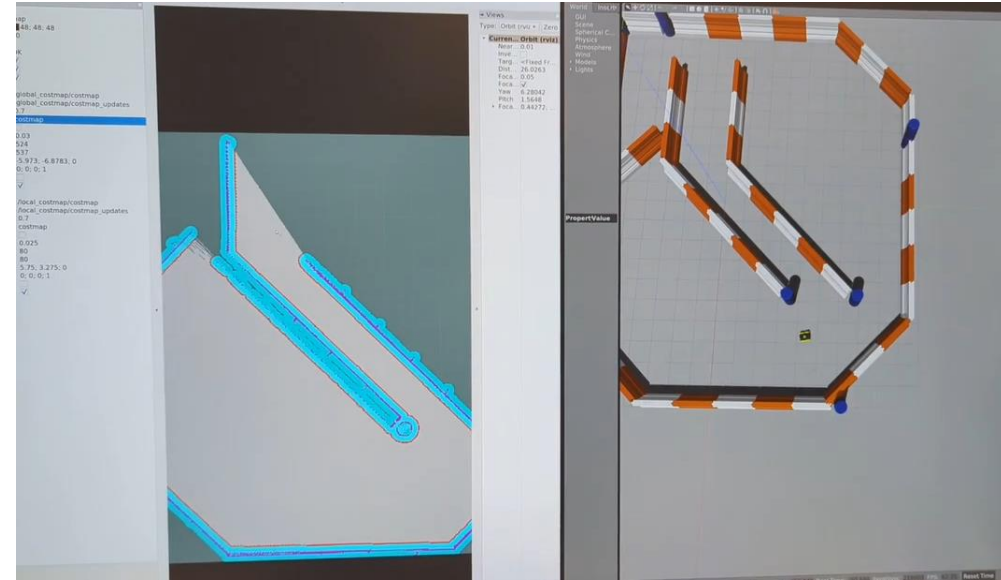
Objectives:

- Investigate fully-autonomous commercially available ground platforms for feasible field deployment to Hanford's tank farms.
 - Test and customize ground platform and sensor configurations (e.g., small-footprint UGVs, all-terrain UGVs, etc., LiDAR)



Year 3 Accomplishments:

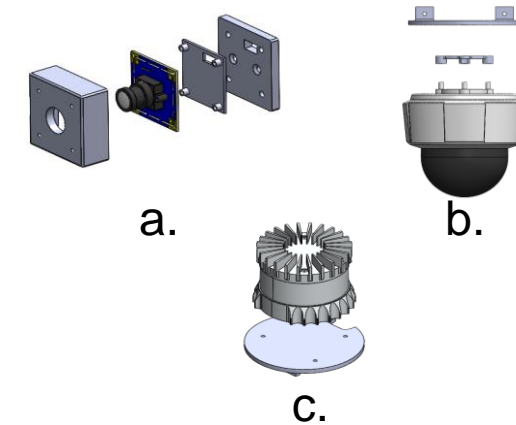
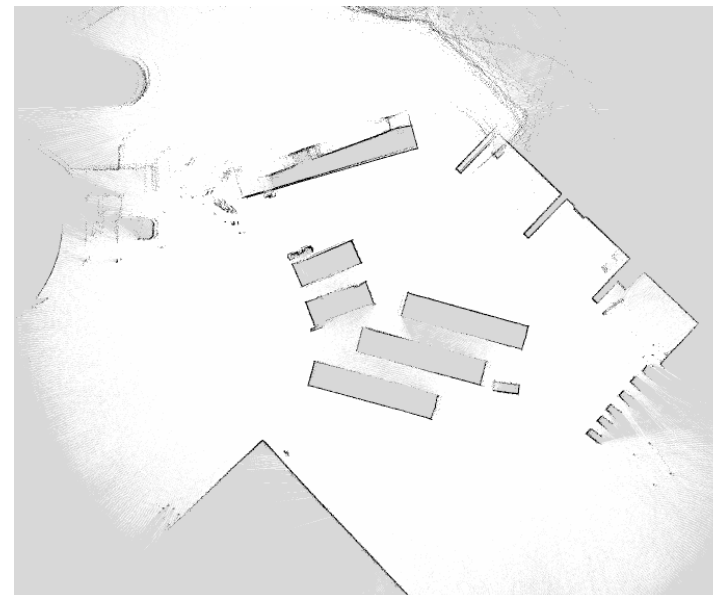
- Develop and test technologies related to semi-autonomy:
 - ROS 2 Navigation Stack
 - Lidar/Laser Odometry
 - Simultaneous Localization and Mapping
- Assembled a small-footprint platform with technology to conduct 2D mapping and point clouds using Lidar
 - Gazebo Simulations
 - Real world mapping
- **Assessed scalability of technology onto larger platforms during a successful internship at Hanford.**



Summer 2023 Internship

Teleoperation from Remote Facility

- Visual and Data Instruments
 - a. Fixed 2D Cameras
 - b. Pitch-Tilt-Zoom (PTZ) Camera
 - c. Lidar
- Robot Visualization (Rviz)
- Camera View
 - Quad View
 - Front-Rear
 - Sides
 - PTZ (via web interface)
- Mapping



Year 4 Objectives:

- Continue development of semi and full autonomy
 - Semi autonomy: waypoint-based navigation for both indoor and outdoor
 - Full autonomy: **frontier-based navigation**
- Real-time data collection and monitoring
- Conduct full indoor map of ARC and outdoor map of EIC **to demonstrate multifaceted use of technology**

LTS-UGV Future Works for Hanford

- Radiation sensor
- Ammonia/Vapor Sensors
- Custom User Interface
- “Proofing” the Robot
 - Thermal/Weather
 - Rad Hardening and/or Shielding



Acknowledgements

- **Principal Investigator:** Leonel Lagos, Ph.D., P.M.P.®
- **DOE Task Collaborators:** Dwayne McDaniel, P.E., Ph.D.; Anthony Abrahao, M.S.
- **DOE Program Manager:** Ravi Gudavalli, Ph.D.
- **Colleagues:** Joel Adams, Ph.D. Candidate
- **WRPS Summer Mentor:** Douglas J. Reid, Ph.D.
- **DOE-FIU Science and Technology Workforce Development Program**
- **Sponsored by the U.S. Department of Energy, Office of Environmental Management, under Cooperative Agreement #DE-EM00005213.**





Thank You. Questions?