

HIGH LEVEL WASTE/WASTE PROCESSING

**Technology Development & Deployment of Robotic and Remote System Tools
in Support of DOE EM’s Mission**

Applied Robotics Laboratory – Technology Description and Applications:

Mini-Rover Inspection Tool:

The mini-rover inspection tool was developed at FIU for inspection of Hanford’s Double Shell Tanks (DSTs). The small unit is capable of inspecting the bottom of the DST by traversing the slots located underneath the tanks. The system was fully tested at FIU and field tested at Hanford. The unit was able to successfully inspect a section of AP-105 DST and provide photo/video feedback to Hanford’s operators.



FIU’s Mini-Rover Inspection Tool

Robotic Platforms with Plug and Play Tools:



This robotic platform was developed at FIU’s Applied Robotics lab under funding from the DOE EM MSIPP Program. The purpose was to develop a tool to conduct repairs at the Hanford Tank Farm’s Pits.

The system consists of a robotic platform with a UR16e robotic manipulator. Several end effectors (tools) have been assembled, such as a grinder and circular cutting wheel. The system includes LiDAR and 3D cameras for mapping of the surroundings and manipulation of the robotic system.

FIU MSIPP Students working on the development of the Robotic Platform with Plug and Play Tools

Wall-Crawler Inspection and Repair Tool:

The wall remote inspection and repair tool is being developed at FIU for applications at Savannah River Site H-Canyon facility. This facility has the need for remote inspection of the ventilation exhaust tunnel. The tool has to remotely inspect the walls and ceiling concrete surfaces. The FIU system is able to crawl horizontal, vertical and overhead surfaces of the tunnel. The FIU system will also include a spraying mechanism to spray a specially formulated coating onto the concrete surfaces of the exhaust tunnel, so that structural stability of the tunnel can be maintained.



FIU’s Wall Crawler Inspection and Repair Tool

ABOUT

Since 1995, the Applied Research Center at Florida International University has provided critical support to the Department of Energy’s Office of Environmental Management mission of accelerated risk reduction and cleanup of the environmental legacy of the nation’s nuclear weapons program. ARC’s research performed under the DOE-FIU Cooperative Agreement (Contract # DE-EM0005213) can be classified as fundamental/basic, proof of principle, prototyping and laboratory experimentation.

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Robotic Systems for Digital Decommissioning

FIU is developing robotic systems integrated with state-of-the-art LiDAR scanners and 3D cameras to capture 3D data from structures awaiting decommissioning. The current system uses off the shell components such as Boston Dynamics SPOT robot and Trimble X7 Laser Scanner. The system is also equipped with infrared cameras and radiation sensors.



Digital Decommissioning Boston Dynamics SPOT and Trimble X7 technologies

Large Area Inspection Robotic Platforms:



Large Area Robotic Inspection Tool with GPR technology – Inspection of LM sites

FIU has developed a large area inspection robotic platform (1st photo) for site inspection of DOE Legacy Management Sites. The robotic platform is assembled with a Ground Penetrating Radar (GPR) technology, 3D cameras, LiDAR and GPS system to remotely inspect large areas at LM sites. The system counts with a robust chassis to overcome the rough terrain encountered at the waste disposal sites such as Old Rifle and Mexican Hat.

In addition, FIU has deployed several drone technologies (2nd photo) at LM sites for the purpose of characterizing and developing 3D maps of these facilities. 3D cameras and LiDAR technologies has been used for developing 3D maps using photogrammetry and 3D point clouds.



Drone technology equipped with 3D cameras and LiDAR technology