Abstract

In this project we demonstrate the idea to help the first responders to determine if it is safe environment for them to operate or not. In this project, we are planning to enhance an INL robot that can perform tasks in hazardous radiation and collapsed structural conditions. The high level commands come from the driver/pilot of the robot, while whole body motion generation and regulation will be modulated autonomously by the controllers in the transport robot.

Objectives

The INL transport robot currently has two UR-5 robots attached to vertical iron bar. The UR-5’s are collaborative robots with six degrees of freedom, flexibility in motion, and ability to carry small payload. Our research aims to enhance its capabilities specifically, navigation, and control, path planning, vision technologies in both two-dimensional and three-dimensional systems, sensors to detect various toxic gases, sensors to detect hazardous radiation levels, identifying people on the other side of the walls, and also drill through the concrete walls and cut through reinforcing rebars.

Methods and Materials

Every equipment used in this project is tested if it survives first in the hazardous radiation conditions. They include:

- Raspberry Pi 4
- UR-5 collaborative robot arm.
- ENTNER Electronics 3D camera
- Ethernet cable
- RS-232 cable
- Robot Operating Systems (ROS)
- 4-D Joystick
- Wrist Tool kit
- Pneumatic controls

Failures

We have tested the robot if it can operate using WiFi or Bluetooth in radiated conditions and it failed. The idea is to run a long cable along with it so that we have enough time for us to accomplish the task.

Expected Results

Thus the aim is to build the robot by the end of 2022 with the respective objectives and functionalities. This project not only focuses on enhancing the robot but also validating the robot’s performance in increasingly complex-manipulation tasks; in other words, a situation resembling real-time environments such as a collapsed structure.

The research would contribute to the development of the American Society for Testing and Materials (ASTM) standards for the type and specification of robots used in emergency scenarios and disaster response.

References


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