PROJECT DESCRIPTION
A teleoperated robot for remotely detecting and handling explosives:

- Gain immediate access to data on the surrounding area
- Manipulate objects including suspicious targets or explosives
- Reliable and easy to pick up by untrained users

FUNCTIONAL ARCHITECTURE

1. UAV (Parrot AR.Drone 2.0)
   - Provides bird's eye view of the environment & top view of the target when disposing the bomb.
   - "Auto-following" The UAV will follow the UGV with tag detection & custom PID controller.

2. UGV (Pioneer 2-AT Robot)
   - "Auto-approaching" The UGV can auto-approach the target with the ultrasonic sensors onboard.
   - Traverses around the environment with the UAV. Mounted with the manipulator arm & mini-PC.

3. Manipulator Arm
   - 5 DoFs: able to pick up objects up to 1 lb. Can be controlled with 2D Cartesian coordinates input.
   - "Stick Figures" Configuration of the arm can be viewed with a set of stick figures in the GUI.

4. Graphical User Interface
   - Offers video feeds, sonar display, buttons for controlling the arm, and battery status.

PERFORMANCE & COMPARISON

VALIDATION V.S. REQUIREMENTS
- Offers stable video feeds (>20 FPS) and responsive control to the operator.
- Able to manipulate objects up to 1 lb.
- Able to climb 15° slopes and 5cm of steps.
- UAV will auto-land in case of emergency.

COMPARISON WITH ONLY A UGV-ONLY SYSTEM

<table>
<thead>
<tr>
<th>INSPECT</th>
<th>UGV ONLY: ~40 mins</th>
<th>UAV+UGV: ~25 mins</th>
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<td>7 targets (1–2 explosives) over a 100ft x 50ft area</td>
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