TechNote

U.S. Department of Homeland Security

Throwable Robots

Throwable Robots are a scouting and surveillance tool for law enforcement and military personnel. They provide situational awareness in unknown and potentially dangerous environments. They can be used to search confined spaces, assist in disposing of explosives, and inspect vehicle undercarriages. Throwable robots have been used or are being used by more than 550 U.S. law enforcement agencies and the U.S. military.

Figure 1. Throwable robot
Photo courtesy of ReconRobotics Inc.

Technology Overview

Throwable robots are scouting and surveillance tools that can examine a confined environment before law enforcement or military personnel enter. They are designed to be easily transported, are shock resistant, and can be remotely controlled. Throwable robots have good shock resistance due to their lightweight design and rugged construction. These robots are deemed to be throwable if they can sustain drops to a basement or be thrown onto a roof. The user can then receive real-time audio and video from a camera typically positioned at the center of the robot's body. Many throwable robots allow their users to receive video in low-light/completely dark environments through infrared or low-light filters. Throwable robots can transmit video and audio through indoor obstacles such as doors and walls. Average battery life is approximately 60 minutes on flat terrain. Throwable robots usually emit low noise levels. Some models are water and dust resistant. Wheels provide mobility to some throwable robots; these wheels can be, and often need to be, replaced due to being thrown or dropped.

Figure 2. Police employing a throwable robot before entering a house
Photo courtesy of ReconRobotics Inc.

Accessories

There are two important accessories for throwable robots: command monitoring station and tether reel. A command monitoring station enables commanders to monitor video and audio transmissions from a distance of hundreds of feet, allowing them to give instructions to first responders from a distance. The station may also able to receive audio and video signals from multiple throwable robots. A tether reel allows the user to

attach a tether to a throwable robot and retrieve the robot once the reconnaissance is completed. Other accessories, such as a field charger for both throwable robots and their controller and field maintenance kits (e.g., wheels, tails, antennas, etc.) are also available.

Applications

Throwable robots are typically deployed in three scenarios– confined space, bomb threat, and vehicle undercarriage inspection. For law enforcement and military personnel, throwable robots can be thrown to a roof, basement, window/hole, attic, or doorway for situational awareness. The user can then search for armed subjects; confirm the number of hostages and their location and wellbeing; listen in on conversations; and examine the layout of rooms. Before

Figure 3. Command monitoring station
Photo courtesy of ReconRobotics Inc.

deploying their bomb disposal robot, bomb squads can deploy a throwable robot for initial inspection of suspicious object(s). Also, explosives might be placed in locations that are not easily accessible to bomb disposal robots, such as a vehicle undercarriage or on a bus. In this case, throwable robots can overcome these obstacles and provide information to the user. For example, the user can send a throwable robot underneath a vehicle and search the undercarriage for explosives, narcotics, and other contraband.

Figure 4. Bomb disposal robot dropping a throwable robot onto a bus
Photo courtesy of ReconRobotics Inc.

Future Developments

For future development, some companies plan to develop magnetized or specialized wheels so throwable robots can climb on hard surfaces such as metal, wood, and brick. This potentially gives throwable robots the capability to climb over the hull of ships so law enforcement can better respond to maritime piracy. There are also plans to add sensors for radiation, temperature, and carbon monoxide detection. Adding sensors to throwable robots increases the weight of the robots and might jeopardize the throwability of the robots.

Procurement

Some throwable robots and accessories are available on GSA Schedules. GSA Schedule is an online acquisition site where federal agencies can purchase commercial products with pre- negotiated volume discount pricing. A throwable robot set contains a throwable robot, a controller, and a charger. Some companies offer a free on-site demonstration or an online presentation for potential customers, and they provide convenient return/replacement, i.e., free return, loaner, anti-lemon, and short turnaround. Repairs are usually conducted in the United States.

Figure 5. Remote monitor
Photo courtesy of ReconRobotics Inc.

Other Scouting Robots

There are other commercially available scouting robots. They tend to be more affordable than throwable robots, but their functionality is not as extensive as throwable robots. One product—a baseball-sized, rubber-coated camera ball—can be thrown like throwable robots, but unlike throwable robots, this robot cannot move or transmit audio. Equipped with six camera lenses, it allows the users to see a 360-degree panorama on their tablet or smartphone (Android or IOS). The robot serves as its own wireless hotspot to ensure the user can receive video without a Wi-Fi connection. It can endure about two dozen drops onto concrete from human height, which meets the U.S. military standard, MIL-STD 810. The robot can transmit video through standard walls. Its battery can run 30 to 90 minutes and is rechargeable. A tether reel is also available for this scouting robot. The developer plans to add sensors to this product as well.

Figure 5. Spherical scouting robot
Photo courtesy of Bounce Imaging Inc.

References

- *ReconRobotics Inc.:* www.reconrobotics.com
- *Bounce Imaging Inc.:* www.bounceimaging.com