Abstract
Currently, remote systems operate by using a wireless connection that allows the system to communicate with a base station. Our objective was to use a Videre ERA Mobile Robot as a remote system and design a deployment mechanism that would facilitate the extension of its operating range by periodically dropping wireless signal repeaters. As in the tale of Hansel and Gretel, the idea is to leave white pebbles to trace a path; however, in this case the pebbles are wireless-enabled miniaturized computers. Our efforts resulted in a robust design that is able to deploy and retrieve repeaters from a remote base station.

System Operation
Through an ad-hoc wireless network, a Linux based program called Player/Stage is used to interact with the robot. A subprogram sends servo signals that the system is able to translate into motor commands to control the arm and gripping mechanism. A second instance of the program displays the Hoyoku Laser Scanner output (fig. 5) for navigating the robot and finding distant repeaters for retrieval. A third instance accesses two infrared sensors placed on the gripper which allow the user to maneuver the repeater into the gripping end effector once the arm is lowered.

Testing and Results
The range was tested by placing a repeater near a corner of Engineering II to measure the increase in distance that the robot could be controlled after the initial wireless signal was lost. In all three tests (fig. 6), the robot was able to travel the distance of the hallway around the corner, which was an extra 105 feet (32 m). Although the robot’s range was extended, the navigation system requires excessive bandwidth. The robot can travel through the hall around a corner, but would need guiding assistance without an operational navigation system. Several test trials of the deployment/retrieval system showed that, after some practice, a driver could confidently deploy, find, and retrieve repeaters using only the on board sensors.

Conclusions
The deployment system is able to place and retrieve wireless repeaters that increase the range of the ERA Mobile Robot. An operator can control the robotic arm and gripping end effector in conjunction with navigation software accurately and reliably from a remote base station. Testing proved that the network concept is functional, however, due to high bandwidth demands, the navigation potential is limited passed approximately 150 feet (50 m).

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