

Robot lab's snake, copter combo rethinks search and rescue (w/ Video)

September 25 2014, by Nancy Owano



Think of search-and-rescue robots and what comes to mind are the little machines that muscle over rough terrain with brute force, said Science News, and they may run into difficulties in trying to access all the nooks and crannies in wreckage. The difficulty, said researchers at the University of Pennsylvania Modular Robotics Laboratory (ModLab), is in part due to small spaces and complex obstacles.

"Many exploration, rescue and mapping applications occur in situations without the air flow or trajectory space for quadrotors, involve chemicals or tasks too dangerous for human beings, and require novel

form factors to fit through small spaces and climb over complicated obstacles," they stated. "These situations include finding injured humans in rubble, or locating explosives in hazardous terrain, among others." The team has been exploring form factors that can succeed in such challenges. Now, wrote Kelsey Atherton in Popular Science, their [creation](#) "combines two snakebots and one quadcopter into a sort of drone superorganism." Their work is noteworthy as a search and rescue research platform intended to address limitations of current [search and rescue](#) robots. They offer a novel form factor marking a fusion—in this instance, snake robots with a quadcopter.

Commenting on their efforts, Meghan Rosen in Science News said, "Pairing two snakelike robots with a flying one has let researchers combine the [exploring](#) skills of small, ground-based bots with the swift moves of an aerial machine."

The snake was designed with seven degrees of freedom: two vertically actuated servos, two horizontally actuated servos and three drive motors. The motors are incorporated into a mainly 3D-printed design, the team said, that aims to optimize structural integrity while minimizing weight. On each [snake robot](#), "we have an Arduino microcontroller running custom-written software in C++. This low-level embedded software takes motor commands from a serial packet and outputs to the snake's motors." Reporting results, they said they were able to show functionality of the robot in each of the three modes: separated mode, tank mode and carry mode.

They call their three-robot system H.E.R.A.L.D: The Hybrid Exploration Robot for Air and Land Deployment. (The two components are (1) a quadrotor and (2) a lightweight, nimble snake. The snake robot is designed to maneuver over and through rubble, and the quadrotor provides aerial surveillance. The integration of these form factors uses *two* snake robots and one quadrotor, for increased maneuverability and

operational lifetime.) They describe their systems as three nimble robots that travel over obstacles by air and through rubble.

The ModLab is a subgroup of the GRASP Lab and the Mechanical Engineering and Applied Mechanics Department at the University of Pennsylvania. A modular robot is described as a versatile system consisting of many simple modules that can change their configuration to suit a given task. The systems are robust, with their abilities to adapt and self-repair.

More information: — modlabupenn.org/hybrid-exploration-loyment-h-e-r-a-l-d/
— ras.papercept.net/conferences/contentListWeb_3.html

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