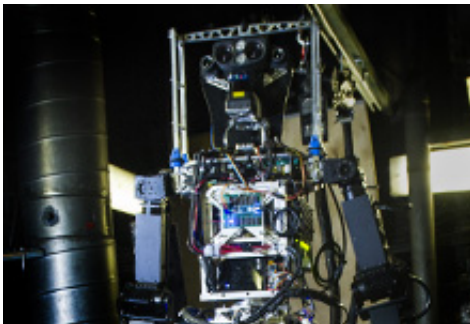


Navy unveils firefighting robot prototype at tech expo (w/ Video)

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Scientists unveiled a firefighting robot prototype Feb. 4 at the Naval Future Force Science & Technology EXPO, revealing details about its successful demonstrations last fall aboard the USS Shadwell, a decommissioned Navy vessel.

The Shipboard Autonomous Firefighting Robot (SAFFiR), sponsored by the Office of Naval Research (ONR), walked across uneven floors, used thermal imaging to identify overheated equipment, and used a hose to extinguish a small fire in a series of experiments Nov. 3-5, 2014.

Developed by researchers at Virginia Tech, the two-legged, or bipedal, [humanoid robot](#) is helping ONR evaluate the applications of unmanned systems in damage control and inspections aboard naval vessels, supporting the autonomy and unmanned systems focus area in the Navy's

Science and Technology Strategy.

"We set out to build and demonstrate a humanoid capable of mobility aboard a ship, manipulating doors and fire hoses, and equipped with sensors to see and navigate through smoke," said Dr. Thomas McKenna, ONR program manager for human-robot interaction and cognitive neuroscience. "The long-term goal is to keep Sailors from the danger of direct exposure to fire."

SAFFiR stands 5 feet 10 inches and weighs 143 pounds. The unique mechanism design on the robot equips it with super-human range of motion to maneuver in complex spaces.

"Balancing on any type of terrain that's unstable – especially for bipedal robots – is very difficult," said Brian Lattimer, associate professor for mechanical engineering at Virginia Tech. "Whole-body momentum control allows for the robot to optimize the locations of all of its joints so that it maintains its center of mass on uncertain and unstable surfaces."

Sensors, including infrared stereovision and a rotating laser for light detection and ranging (LIDAR), enable the humanoid to see through dense smoke. It is programmed to take measured steps and handle hoses on his own, but for now, takes his instruction from researchers at computer console.

"The robot has the ability to do autonomous tasks, but we have a human in the loop to allow an operator to intervene in any type of task that the robot's doing," Lattimer said.

McKenna plans to sponsor a more advanced design as part of the long-term investigational research program. Blueprints include equipping the robot with enhanced intelligence, communications capabilities, speed,

computing power and battery life for extended applications.

"We have taken a look at other kinds of sensors that you can put on these robots," he said. "For instance, a bipedal robot could be configured to take shipboard measurements, scan for corrosion and leaks, and identify changes to the shape of the room from its original configuration. By taking on these time-consuming tasks, SAFFiR could free up Sailors for jobs that more fully take advantage of their training and technical skillsets."

Even with added intelligence, however, SAFFiR will take its instruction from Sailors and "fire bosses" working remotely in the event of a fire or other dangerous event.

"We're working toward human-[robot](#) teams" McKenna said. "It's what we call the hybrid force: humans and robots working together."

Provided by Office of Naval Research

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