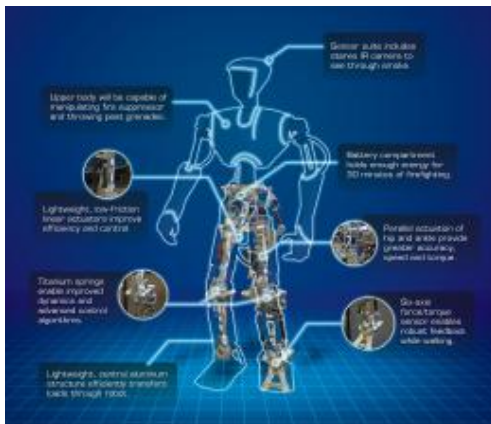


NRL designs robot for shipboard firefighting



The Naval Research Laboratory's Shipboard Autonomous Firefighting Robot (SAFFiR) is a humanoid-type robot being designed for shipboard firefighting. Credit: U.S. Naval Research Laboratory

(PhysOrg.com) -- In both war and peacetime scenarios, fire in the shipboard environment is serious and frequently results in excessive damage and high repair costs because the fire is not detected or controlled adequately. To help further improve future shipboard firefighting capability, scientists at the Naval Research Laboratory have formed an interdisciplinary team to develop a humanoid robot that could fight fires on the next generation of combatants. A humanoid-type robot was chosen because it was deemed best suited to operate within the confines of an environment that was designed for human mobility and offered opportunity for other potential warfighting applications within the Navy and Marine Corps.



Virginia Tech and the University of Pennsylvania are working with NRL on the firefighting robot project. NRL's firefighting robot will be a follow-on version to the existing Virginia Tech CHARLI-L1 robot, pictured here. Credit: Virginia Tech

The firefighting [robot](#), called the Shipboard Autonomous Firefighting Robot (SAFFiR), is being designed to move autonomously throughout the ship, interact with people, and fight fires, handling many of the dangerous firefighting tasks that are normally performed by humans. The [humanoid robot](#) should be able to maneuver well in the narrow passages and ladderways that are unique to a ship and challenging for most older, simpler robots to navigate.

The robot is designed with enhanced multi-modal [sensor technology](#) for advanced navigation and a sensor

suite that includes a camera, [gas sensor](#), and stereo IR camera to enable it to see through smoke. Its upper body will be capable of manipulating fire suppressors and throwing propelled extinguishing agent technology (PEAT) grenades. It is battery powered that holds enough energy for 30 minutes of firefighting. Like a sure-footed sailor, the robot will also be capable of walking in all directions, balancing in sea conditions, and traversing obstacles.

Another key element of the SAFFiR development is to allow damage control personnel and the robot to work cohesively as a team. Algorithms are being developed to allow autonomous mobility and decision making by the robot as a team member. To enable natural interaction with a human team leader, the robot will have multimodal interfaces that will enable the robot to track the focus of attention of the human team leader, as well as to allow the robot to understand and respond to gestures, such as pointing and hand signals. Where appropriate, natural language may also be incorporated, as well as other modes of communication and supervision.

Researchers from Virginia Tech and University of Pennsylvania are also working with NRL on the project. They plan to test the firefighting robot in a realistic firefighting environment onboard the ex-USS Shadwell in late September 2013.

The Navy Technology Center for Safety & Survivability, located at NRL in Washington, DC, carries out research aimed to solve current and future Navy problems regarding combustion, fire extinguishment, fire modeling and scaling, damage control, and atmosphere hazards. The Center has unique fire research facilities that include pressurable chambers up to a 10,000 cubic foot capacity at the Centers test site at NRL's Chesapeake Bay Detachment in Calvert County, Maryland. The Center also has custody of the world's unique fire test ship, ex-USS Shadwell (LSD-15) located in Mobile Alabama, where full-scale fire and damage control tests are conducted using the reality conformations of active duty sailors. Using the ex-USS Shadwell, NRL scientists are able to enhance their technology base for introducing advanced damage control concepts to the fleet. The ship provides a unique opportunity to realistically experience a true damage control environment, to create a partnership between the technical and fleet communities, and to take advantage of new insights gleaned during full-scale experimentation.

The Navy Center for Applied Research in Artificial Intelligence (NCARAI) has been involved in both basic and applied research in artificial intelligence, human factors, and human-centered computing since its inception in 1981. NCARAI, part of the Information Technology Division within NRL, is engaged in research and development efforts designed to address the application of artificial intelligence technology and techniques to critical Navy and national problems. The NCARAI is developing the algorithms that allow the firefighting robot to work naturally with human firefighters, as well as high-level reasoning capabilities.

The Laboratory for Autonomous Systems Research will provide specialized facilities to support highly innovative, multidisciplinary research in autonomous systems, including intelligent autonomy, sensor systems, power and energy systems, human-system interaction, networking and communications, and platforms. The Laboratory will capitalize on the broad multidisciplinary character of NRL, bringing together scientists and engineers with disparate training and backgrounds to attack common goals in autonomous systems at the intersection of their respective fields. The Laboratory will provide unique facilities and simulated environments (littoral, desert, tropical) and instrumented reconfigurable high bay spaces to support integration of science and technology components into research prototype systems. The objective of the Laboratory is to enable Navy and DoD scientific leadership in this complex, emerging area and to identify opportunities for advances in future defense technology.

Provided by Naval Research Laboratory

This document is subject to copyright. Apart from any fair dealing for the purpose of private study, research, no part may be reproduced without the written permission. The content is provided for information purposes only.