A Robot for Any Disaster

The Pentagon's humanitarian android is getting closer to replacing first responders who risk their lives after a catastrophe.

THERE'S AN AMAZING VIDEO on YouTube of the world's most advanced humanoid robot. The footage shows it in a series of testing rooms, with engineers popping in and out—monitoring the machine, tapping out commands on keyboards, smiling at one another with what looks like pride, or shock, or both. In one clip the robot walks on a treadmill with astonishing smoothness. An engineer slips a 2 x 4 under its foot—simulating an obstacle on some rocky terrain, we are to assume—and the robot ably steps over it. Cut to the robot standing on one foot and getting clocked in the side with a 20-kilogram ball, then adjusting its body to stay balanced. Cut to the robot navigating a treacherous hole in a hallway floor by pressing its arms against the walls, suspending itself over the void and inching along until it reaches safety.

It runs with agility. It reaches for objects fluidly. It moves with purpose.

It moves like a human.

Atlas was designed by Boston Dynamics, a leading robotics company, under contract with the Pentagon. The goal was to create a bot that could replace rescue workers in dangerous areas—Yosemite during last year's wildfires, for example, or the Philippines after a massive typhoon, or Napa, California, after the 6.0 earthquake in August. Thousands of first responders each year are put in danger, or die, at such sites. The 6-foot 2-inch, 330-pound Atlas uses hydraulically driven joints to exert massive force—one kick can turn a cinder block into crumbs. Hydraulics also allow Atlas to right itself if it's thrown off balance. When Atlas runs, range-finding sensors render the way forward in 3D so it won't trip. Tools such as screwdrivers fit onto its articulated hands.

Atlas's origins date back to the 1980s, when roboticist Marc Raibert built a pogo stick with dynamic balance at his Carnegie Mellon and MIT labs. By 1992 he had founded Boston Dynamics, assembling self-balancing robots. One was Petman, Atlas's predecessor, built from 2009 to 2011.

When an earthquake and tsunami caused a catastrophic nuclear meltdown at Japan's Fukushima Daiichi plant in 2011, the search-and-rescue bots at the time proved painfully inadequate. Automatons had been developed for disasters going back to Three Mile Island in 1979, Chernobyl in 1986, and the 9/11 attack sites, but those robots had sensors and cameras for locating victims and mapping the site—and few other capabilities. To accelerate the development of truly useful humanitarian robots, the Pentagon in 2012 launched the DARPA Robotics Challenge (DRC), out of which Atlas grew.

A team of about 30 Boston Dynamics engineers evolved Petman into Atlas for the DRC. They unveiled the robot in July 2013. In October the company began upgrading Atlas's arms and battery, and will eventually cut its power cord. Now teams in the DRC challenge—more than half using the Atlas platform—are deciding how much control to maintain over the machine and how much they want Atlas to decide on its own. "The pinnacle for us will be getting to the sweet spot where the human only contributes what humans do better than computers," says Russ Tedrake, leader of Team MIT.

Atlas currently lacks the dexterity to extract a person trapped in rubble. But if you watch the video, you can see Atlas being useful even now—knocking down a wall, lifting huge rocks, traversing a muddy pit. All of these actions will help the robot get to survivors after a disaster strikes. We hope one never does. We know it will. – DAVEY ALBA

SUPERSTRONG

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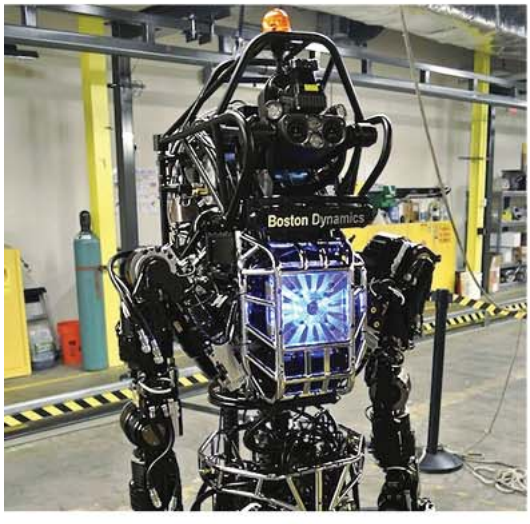
Hydraulics drive Atlas, making it much more powerful than electrical robots.



BREAKTHROUGH

WHO
Boston Dynamics
Waltham, Mass.

FIELD
Humanoid Robotics

ACHIEVEMENT
Creating a semi-autonomous search-and-rescue robot.

KAMILA KRAWCZUK
Eighth Grade
Pope John Paul II School
New Britain, Conn.

NEXT GENERATION

THE DRAWING ROBOT

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Krawczuk, 13, applied her knowledge of electrical engineering, computer coding (at which she is self-taught), and calculus to make a robot capable of writing her school's initials. What were you doing when you were 13? Right. Exactly.

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RECOGNITION Four major awards, including the Xerox Computer Science Awards, First Place, Middle School