

Tactical Technology Office

DARPA Robotics Challenge (DRC)

The Department of Defense's strategic plan calls for the Joint Force to conduct humanitarian, disaster relief, and related operations. Some disasters, due to grave risks to the health and wellbeing of rescue and aid workers, prove too great in scale or scope for timely and effective human response. The DARPA Robotics Challenge (DRC) seeks to address this problem by promoting innovation in human-supervised robotic technology for disaster-response operations.

The primary technical goal of the DRC is to develop human-supervised ground robots capable of executing complex tasks in dangerous, degraded, human-engineered environments. Competitors in the DRC are developing robots that can utilize standard tools and equipment commonly available in human environments, ranging from hand tools to vehicles.

To achieve its goal, the DRC is advancing the state of the art of supervised autonomy, mounted and dismounted mobility, and platform dexterity, strength, and endurance. Improvements in supervised autonomy, in particular, aim to enable better control of robots by non-expert supervisors and allow effective operation despite degraded communications (low bandwidth, high latency, intermittent connection).

The DRC program website (<http://www.theroboticschallenge.org> (<http://www.theroboticschallenge.org>)) provides program highlights, including the DRC Trials held in December 2013. The website also covers competing team information, Challenge rules, videos/images, and frequently asked questions in preparation for the DRC Finals in June 2015.

Program Manager

Dr. Gill Pratt
gill.pratt@darpa.mil

Program Images





[Click for High-Resolution Image](#)

Team SCHAFT's S1 robot finished first in the December 2013 DRC Trials after scoring the most points in a series of eight challenge tasks that tested robot hardware, software, and operator control interface.



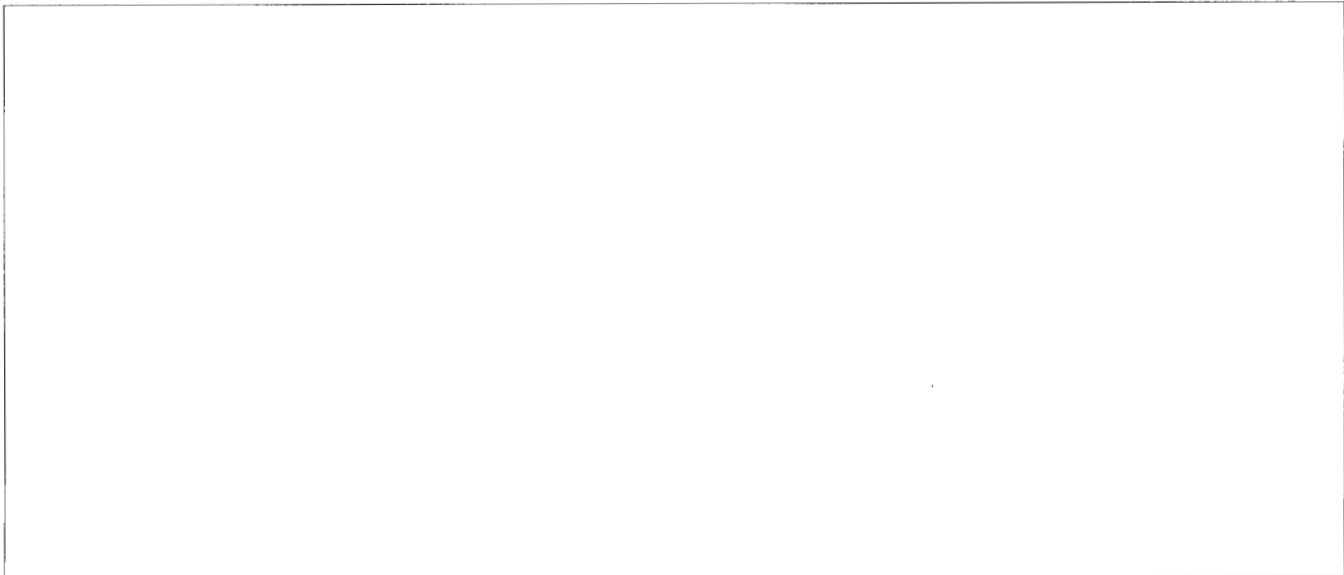
[Click for High-Resolution Image](#)

Operators at the DRC Trials controlled their robots from a removed location and only received input from the robots' onboard sensors, simulating the conditions that would apply in actual disasters.



[Click for High-Resolution Image](#)

Artist's concept of robots competing in the DARPA Robotics Challenge



The DARPA Robotics Challenge



The DRC is a competition of robot systems and software teams vying to develop robots capable of assisting humans in responding to natural and man-made disasters. It was designed to be extremely difficult. Participating teams, representing some of the most advanced robotics research and development organizations in the world, are collaborating and innovating on a very short timeline to develop the hardware, software, sensors, and human-machine control interfaces that will enable their robots to complete a series of challenge tasks selected by DARPA for their relevance to disaster response.

The DRC Finals will take place from June 5-6, 2015 at Fairplex in Pomona, California. The DRC Finals will require robots to attempt a circuit of consecutive physical tasks, with degraded communications between the robots and their operators; the winning team will receive a \$2 million prize.

Technologies resulting from the DRC will transform the field of robotics and catapult forward development of robots featuring task-level autonomy that can operate in the hazardous, degraded conditions common in disaster zones.

NEWS



DRC Finals Announcement - June 26, 2014

From June 5-6, 2015, California will be the stage for the DARPA Robotics Challenge (DRC) Finals. Teams from around the world will meet at Fairplex in Pomona to compete for the \$2 million prize to be awarded to the team that best demonstrates human-supervised robot technology for disaster response.



DRC Trials Website Archived - April 8, 2014

The DRC Trials Website has been archived and can be found by visiting the following link:
<http://archive.darpa.mil/roboticschallengetrialsarchive/>



FIELD OF COMPETITORS EXPANDS FOR DRC FINALS - April 8, 2014

Team SCHAFT, the highest-scoring team at the DARPA Robotics Challenge (DRC) Trials in December 2013, has elected to switch to the self-funded Track D of the program. The team was recently acquired by Google Inc.

DARPA will now include on the list of DRC Trials finalists Teams THOR, VIGIR, and KAIST, which each earned eight points in the...

Additional government assistance in organizing the DARPA Robotics Challenge Trials has come from the Air Force Research Laboratory (AFRL), the Navy's SPAWAR Systems Center Atlantic and the National Institute of Standards and Technology (NIST).

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What is the DARPA Robotics Challenge (DRC)?

The DRC is a competition of robot systems and software teams vying to develop robots capable of assisting humans in responding to natural and man-made disasters. It was designed to be extremely difficult. Participating teams, representing some of the most advanced robotics research and development organizations in the world, are collaborating and innovating on a very short timeline to develop the hardware, software, sensors, and human-machine control interfaces that will enable their robots to complete a series of challenge tasks selected by DARPA for their relevance to disaster response. Three sequential DRC events place equal emphasis on hardware and software:

- the Virtual Robotics Challenge occurred in June 2013 and tested software teams' ability to effectively guide a simulated robot through three sample tasks in a virtual environment;
- the DRC Trials occurred December 20-21, 2013 at the Homestead-Miami Speedway, where teams guided their robots through eight individual, physical tasks that tested mobility, manipulation, dexterity, perception, and operator control mechanisms; Read more about it at <http://www.darpa.mil/NewsEvents/Releases/2013/12/26.aspx>
- the DRC finals will occur June 5-6, 2015 at Fairplex in Pomona, California. The event will require robots to attempt a circuit of consecutive physical tasks, with degraded communications between the robots and their operators; the winning team will receive a \$2 million prize. Read more at [Finals Announcement](#)

Technologies resulting from the DRC will transform the field of robotics and catapult forward development of robots featuring task-level autonomy that can operate in the hazardous, degraded conditions common in disaster zones.

What Is the DRC Trying to Achieve?

History has repeatedly demonstrated that humans are vulnerable to natural and man-made disasters, and there are often limitations to what we can do to help remedy these situations when they occur. Robots have the potential to be useful assistants in situations in which humans cannot safely operate, but despite the imaginings of science fiction, the actual robots of today are not yet robust enough to function in many disaster zones nor capable enough to perform the most basic tasks required to help mitigate a crisis situation.

The goal of the DRC is to generate groundbreaking research and development in hardware and software that will enable future robots, in tandem with human counterparts, to perform the most hazardous activities in disaster zones, thus reducing casualties and saving lives.

How Will DARPA Characterize Success in the DRC?

Because disasters are so unpredictable in their manifestation and effects, the type of robots DARPA envisions to aid in these situations must be adaptable and require four key capabilities to be effective:

- Mobility and dexterity to maneuver in the degraded environments typical of disaster zones;
- Ability to manipulate and use a diverse assortment of tools designed for humans;
- Ability to be operated by humans who have had little to no robotics training;
- Partial autonomy in task-level decision-making based on operator commands and sensor inputs

The DRC Trials will test all of these capabilities, but primarily mobility, manipulation, and dexterity. The DRC Finals will be a more robust and demanding test of all four capabilities.

What Is the State of Robots Today Relative to Where DARPA Wants It to Be?

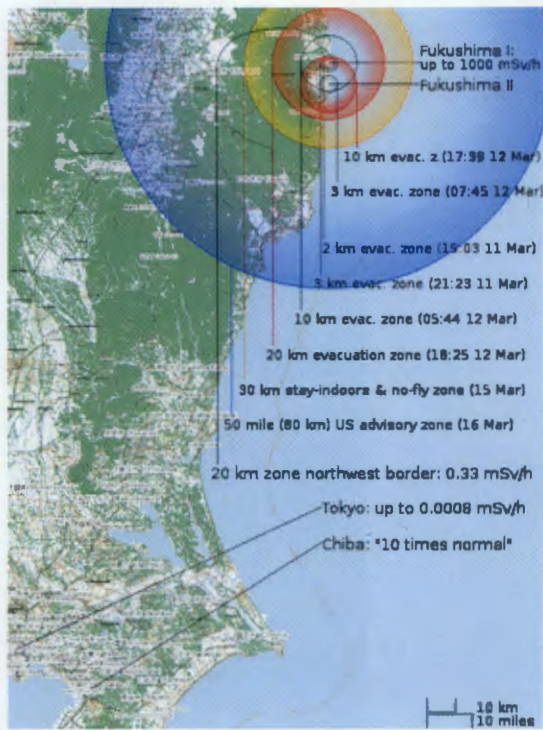
Impressive as they are, most robots today are either limited to pristine and precisely controlled settings like factories and research labs, employed in simple, repetitive tasks, or used as mechanical stand-ins for humans who must direct their every move. These kinds of robots cannot deal well with unpredictability and unstructured environments.

The unpredictability of the real world requires a robot that can maneuver effectively in environments it has not previously encountered, use whatever human tools are on hand without the need for extensive reprogramming, and continue to operate even when degraded communications render motion-level control by a human not feasible. Getting to that goal requires an attribute called "supervised" or "task-level" autonomy. The term means, for example, that a human operator could issue a robot a command like "Open the door" and the robot would be able to complete that task by itself, taking into account the sensing and motions involved in identifying a door handle, applying the right force, and appropriately maneuvering its limbs. Task-level autonomy is the opposite of tele-operation, in which an operator gives a robot step-by-step commands in terms of what motions to take and specifically when and where to place its limbs.

What Results Might the DRC Deliver?

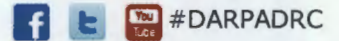
The DRC Trials gave DARPA a baseline on the current state of robotics and determine which teams will continue to receive DARPA funding to expand on their potential. Imposing and unusual as the robots competing in the trials might seem, they will move slowly through the tasks. Like a one-year-old child beginning to walk and interact with the world, there will be stumbles and falls. When the DARPA Grand Challenges first tested driverless vehicle technology, the competitors got off to a shaky start, but there was extraordinary improvement in the year between the two challenges. Similarly, the DRC Trials will mark the beginning of an historic transformation in robotics.

By the time of the DRC Finals, we expect the robots will



demonstrate roughly the competence of a two-year-old child, giving them the ability to autonomously carry out simple commands such as "Clear the debris in front of you" or "Close the valve." The robots will still need to be told by human operators which tasks to chain together to achieve larger goals, but DARPA's hope is that this demonstration will show the promise disaster response robots hold for mitigating the effects of future disasters.

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NEWS

After Impressive Demonstrations of Robot Skill, DARPA Robotics Challenge Trials Conclude

December 26, 2013

8 teams eligible to receive up to \$1 million to prepare for upcoming DRC Finals

DARPA Robotics Challenge Trials Day Two Wrap

On December 20-21, 2013, 16 teams were the main attraction at the DARPA Robotics Challenge (DRC) Trials, where they demonstrated their prototype robots' ability to perform a number of critical real-world disaster-response skills. DARPA constructed eight tasks (<http://www.darpa.mil/NewsEvents/Releases/2013/12/21.aspx>) at the Homestead Speedway in Homestead, Fla., to simulate what a robot might have to do to safely enter and effectively work inside a disaster zone, while its operator would remain out of harm's way.

After two days of competition, DARPA selected eight teams to receive up to \$1 million in funding to continue their work. The scores, out of a total of 32 points, were:

- 27 points: SCHAFT (SCHAFT, Inc., Tokyo, Japan)
- 20 points: IHMC Robotics (Florida Institute for Human & Machine Cognition, Pensacola, Fla.)

- 18 points: Tartan Rescue (Carnegie Mellon University, National Robotics Engineering Center, Pittsburgh, Pa.)
- 16 points: Team MIT (Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory, Boston, Mass.)
- 14 points: RoboSimian (NASA Jet Propulsion Laboratory (JPL), Los Angeles, Calif.)
- 11 points: Team TRACLabs (TRACLabs, Inc., Webster, Tex.)
- 11 points: WPI Robotics Engineering C-Squad (Worcester Polytechnic Institute, Worcester, Mass.)
- 9 points: Team Trooper (Lockheed Martin Advanced Technology Laboratories, Cherry Hill, N.J.)

“At the start of the event, I said that I would be thrilled if even one team scored half the points available,” said Gill Pratt (http://www.darpa.mil/Our_Work/DSO/Personnel/Dr_Gill_Pratt.aspx), the DARPA program manager for the DRC, during the event’s closing ceremony. “The event exceeded my expectations multiple, multiple times over, with the top four teams each scoring half or more. The success and reliability of the various hardware and software approaches that the teams demonstrated outside their laboratories was tremendous to see in action and sets an important baseline going forward.”

A number of teams also received special recognition in conducting the eight tasks based on the number of points received and speed:

- Walk Across Rough Terrain; Remove Debris from Doorway; Climb Industrial Ladder; Carry and Connect Fire Hose: SCHAFT
- Open Series of Doors; Cut Through Wall: IHMC Robotics
- Drive and Exit Utility Vehicle: WRECS
- Locate and Close Leaking Valves: Team THOR

The awards ceremony capped off a second day in which spectators—including many families with children—enjoyed an atmosphere similar to a traditional sporting event, not a scientific exercise. In addition to the Trials, DARPA hosted the DRC Exposition that demonstrated first responder exercises and their technology needs.

DARPA Robotics Challenge Trials Exposition

“The DRC Trials demonstrated the difficulty of having robots conduct seemingly simple tasks in real-world situations, and the participation of the first responder community provided an important illustration of how technology can save lives,” said Brad Tousley, Director of DARPA’s Tactical Technology Office. “This event was yet another example why challenges work to attract new ideas and help quickly advance technology to solve a focused need.”

With the conclusion of the DRC Trials, DARPA and the teams are now looking ahead to the DRC Finals sometime in the next 12-18 months. The Finals will be an opportunity for the eight top teams and the other eight participating teams to continue their efforts alongside new teams to vie for the chance to win the DRC’s \$2 million prize.

Pratt has already identified three initial goals for the next competition. “First, we’d like the robots to be more stable so they don’t fall, and if they do fall, be more robust so they won’t break,” he said. “Second, have the robots work without their tethers by using wireless communications and more efficient, self-contained power systems. Finally, we’d like the robots to use more task-level autonomy in unstructured environments such as those found in real disasters.”

More information, images and video are available at www.theroboticschallenge.org

(<http://www.theroboticschallenge.org/>) .

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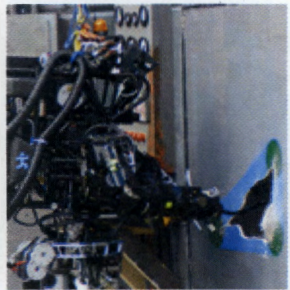
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Images



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Team SCHAFT raises the arms of its S-One robot in victory after successfully completing the Climb Industrial Ladder task at the DRC Trials. SCHAFT won that task and three others, and scored the most points of any team at the event.



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Ian, an Atlas robot with IHMC Robotics, successfully cuts a hole in a wall—a common action that human first responders perform. IHMC Robotics won the Cut Through Wall task and ranked second overall in the competition.



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CHIMP, the CMU (Carnegie Mellon University) Highly Intelligent Mobile Platform, carries a fire hose to connect it to a wall spigot.

The robot from the Tartan Rescue team, CHIMP came in third overall in the competition.

Additional Info

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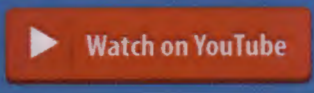
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Three Teams Take Top Honors at DARPA Robotics Challenge Finals



MISS THE CHALLENGE? WATCH HIGHLIGHTS AND RUNS FROM THE TWO-DAY EVENT HERE



Robots from Republic of Korea and United States take home \$3.5 million in prizes

"May the best robot win" has been a frequently uttered phrase throughout the DARPA Robotics Challenge Finals, held this Friday and Saturday at the Fairplex in Pomona, California. After years of research and development, several intense days of preparation at the competition site, a day of rehearsal and two full days of head-to-head competition in front of thousands of spectators, the verdict is in.

Taking first place and the \$2 million in prize money that goes with it is Team Kaist of Daejeon, Republic of Korea, and its robot DRC-Hubo. Coming in second and taking home \$1 million is Team IHMC Robotics of Pensacola, Fla., and its robot Running Man. The third place finisher, earning the \$500,000 prize, is Tartan Rescue of Pittsburgh, and its robot CHIMP.

DARPA program manager and DRC organizer Gill Pratt congratulated all 23 participating teams and thanked them for helping to open a new era of partnership between robots and humans.

"These robots are big and made of lots of metal and you might assume people seeing them would be filled with fear and anxiety," Pratt said. "But we heard groans of sympathy when those robots fell. And what did people do every time a robot scored a point? They cheered! It's an extraordinary thing, and I think this is one of the biggest lessons from DRC—the potential for robots not only to perform technical tasks for us, but to help connect people to one another."

Launched in response to a humanitarian need that became glaringly clear during the nuclear disaster at Fukushima, Japan, in 2011, the DARPA Robotics Challenge consisted of three increasingly demanding competitions over two

DRC FINALS TEAM STANDINGS

TEAM	SCORE	TIME
TEAM KAIST	8	44:28
TEAM IHMC ROBOTICS	8	50:26
TARTAN RESCUE	8	55:15
TEAM NIMBRO RESCUE	7	34:00
TEAM ROBOSIMIAN	7	47:59
TEAM MIT	7	50:25
TEAM WPI-CMU	7	56:06
TEAM DRC-HUBO AT UNLV	6	57:41
TEAM TRAC LABS	5	49:00
TEAM AIST-NEDO	5	52:30
TEAM NEDO-JSK	4	58:39
TEAM SNU	4	59:33
TEAM THOR	3	27:47
TEAM HRP2-TOKYO	3	30:06
TEAM ROBOTIS	3	30:23
TEAM VIGIR	3	48:49
TEAM WALK-MAN	2	36:35
TEAM TROOPER	2	42:32
TEAM HECTOR	1	02:44
TEAM VALOR	0	00:00
TEAM AERO	0	00:00
TEAM GRIT	0	00:00
TEAM HKU	0	00:00

Recent News



Robotics Challenge Workshop: From Better Robots to Better

Futures
06/07/2015

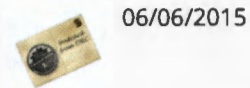
All Too Human, All Too Robotic

years. The goal was to accelerate progress in robotics and hasten the day when robots have sufficient dexterity and robustness to enter areas too dangerous for humans and mitigate the impacts of natural or man-made disasters.

The DRC Finals competition challenged participating robotics teams and their robots to complete a difficult course of eight tasks relevant to disaster response, among them driving alone, walking through rubble, tripping circuit breakers, turning valves and climbing stairs. A dozen teams from the United States and another eleven from Japan, Germany, Italy, Republic of Korea and Hong Kong competed in the outdoor competition.

"This is the end of the DARPA Robotics Challenge but only the beginning of a future in which robots can work alongside people to reduce the toll of disasters," said DARPA Director Arati Prabhakar. "I am so proud of all the teams that participated and know that the community that the DRC has helped to catalyze will do great things in the years ahead."

DARPA holds demonstration events to prove the possible. There was never a plan for Darpa to continue the robotics challenge beyond the Finals event that occurred in June 2015. There are a number of international activities that will continue the effort.



06/06/2015



A Day at the Robotics Challenge

06/05/2015



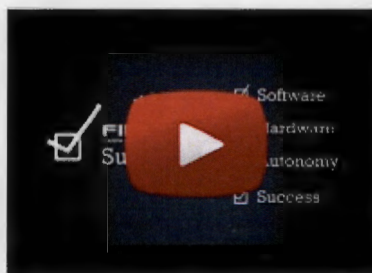
Lending a Hand

06/05/2015

1 of 5

next >

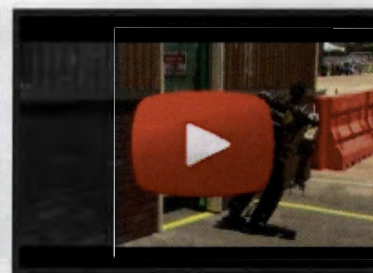
Catch Up on The DARPA Robotics Challenge



The DRC Program: 2012-2015



DRC Finals Event Compilation



A Celebration of Risk



DRC

Welcome to The DARPA Robotics Challenge

The DRC is a competition of robot systems and software teams vying to develop robots capable of assisting humans in responding to natural and man-made disasters. It was designed to be extremely difficult. Participating teams, representing some of the most



advanced robotics research and development organizations in the world, are collaborating and innovating on a very short timeline to develop the hardware, software, sensors, and human-machine control interfaces that will enable their robots to complete a series of challenge tasks selected by DARPA for their relevance to disaster response.

The DRC Finals will take place from June 5-6, 2015 at Fairplex in Pomona, California. The DRC Finals will require robots to attempt a circuit of consecutive physical tasks, with degraded communications between the robots and their operators; the winning team will receive a \$2 million grand prize; DARPA plans to award \$1 million to the runner-up and \$500,000 to the third-place team.

Technologies resulting from the DRC will transform the field of robotics and catapult forward development of robots featuring task-level autonomy that can operate in the hazardous, degraded conditions common in disaster zones.

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Teams

DRC Finals - Qualified Teams



TARTAN RESCUE



TEAM AERO



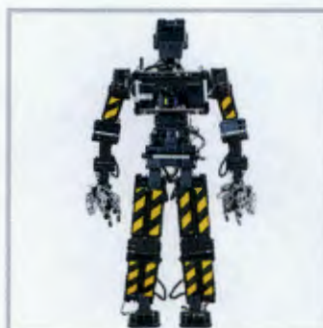
TEAM AIST-NEDO



TEAM DRC-HUBO AT UNLV



TEAM GRIT



TEAM HECTOR



TEAM HKU



TEAM HRP2-TOKYO



TEAM IHMC ROBOTICS



**TEAM INTELLIGENT
PIONEER**



TEAM KAIST



TEAM MIT



TEAM NEDO-HYDRA



TEAM NEDO-JSK



TEAM NIMBRO RESCUE



TEAM ROBOSIMIAN



TEAM ROBOTIS



TEAM SNU



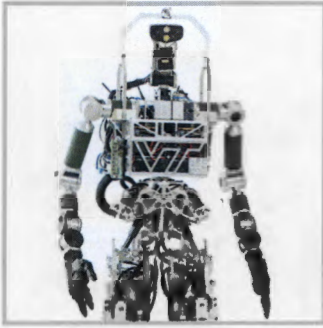
TEAM THOR



TEAM TRAC LABS



TEAM TROOPER



TEAM VALOR



TEAM VIGIR



TEAM WALK-MAN



TEAM WPI-CMU

Team Resources

- [Rule Book](#) (Reference: Rule Book's Differences Matrix)
- [Operations Book](#)
- [Technical FAQ Document](#)
- [Qualification Guidelines](#)

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Media


The DARPA Robotic Challenge Finals will occur June 5-6, 2015 at Fairplex in Pomona, California. Watch this page for the latest news.

Online Media registration is now closed. Onsite registration will be available starting Thursday, June 4th @ 5 PM PDT

Media Resources

- [Team Contact Information \(pdf\)](#) May 28, 2015
- [DARPA Robotics Challenge Program Information](#)
- [Team Funding Structure \(jpg\)](#) May 29, 2015
- [2013 DRC Trials Overview](#)

Video and Image Resources

- [DRC Finals B-Roll and Press Conferences](#)
-  [Dropbox Hi-Res Images](#)

Online Press Kit

- [Media Coverage Options and Logistics \(pdf\)](#) June 6, 2015
- [Wireless Guidelines \(pdf\)](#) May 14, 2015
- [From Better Robots to Better Futures \(pdf\)](#) May 19, 2015

DARPA Robotics Challenge in the News

- [Science News: Designing Robots to Help in a Disaster](#)
- [Washington Post: Meet the Future First Responders](#)
- [RoboHub: Gill Pratt on commercial investment in Robotics](#)
- [Thebulletin.org: Bulletin of Atomic Scientist - Robots to the Rescue](#)

Challenge Documents

- [Rule Book \(pdf\)](#) April 9, 2015
- [Operations Book \(pdf\)](#) April 30, 2015
- [Technical FAQ Document \(pdf\)](#) June 3, 2015
- [Qualification Guidelines \(pdf\)](#) November 19, 2014
- [Spectator Fact Sheet \(pdf\)](#) May 28, 2015

DARPA Robotics Challenge Updates

- [Twenty-five teams from around the world to participate in DRC Finals - March 5, 2015](#)
- [Upgrades to Atlas Robot - January 20, 2015](#)

- [The DARPA Robotics Challenge Continues June 2015 in Southern California](#) - June 26, 2014
- [Field of Competitors Expands for DRC Finals](#) - March 21, 2014
- [After Impressive Demonstrations of Robot Skill, DRC Trials Conclude](#) - December 26, 2013

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News

Field of Competitors Expands for DRC Finals

March 21, 2014

Track switch by Team SCHAFT allows Teams ViGIR, THOR, and KAIST to become DRC Trials finalists; ViGIR and THOR become eligible to receive DARPA funding for participation in DRC Finals

Team SCHAFT, the highest-scoring team at the DARPA Robotics Challenge (DRC) Trials (<http://www.theroboticschallenge.org/>) in December 2013, has elected to switch to the self-funded Track D of the program. The team was recently acquired by Google Inc.

Team SCHAFT's move frees funds for DARPA to support additional teams to compete in the DRC Finals. DARPA will now include on the list of DRC Trials finalists Teams THOR, ViGIR, and KAIST, which each earned eight points in the DRC Trials. Teams THOR and ViGIR are each eligible for up to \$500K of DARPA funding. Team KAIST, which is already part of Track D, will continue as a self-funded team.

Professor Dennis Hong, the leader of Team THOR at the DRC Trials, has moved to The University of California, Los Angeles (UCLA). As a result, Team THOR has opted to split into two teams that will divide the DARPA funding. One team will be based at UCLA under the leadership of Prof. Hong, while the other team will remain at Virginia Polytechnic Institute and State University (Virginia Tech) under the leadership of Prof. Tomo Furukawa.

DRC program manager Gill Pratt noted, "The decision by Team SCHAFT to self-fund allows DARPA to expand the competition and further develop disaster response robots. This expansion is similar to what happened after DARPA held the Virtual Robotics Challenge in June 2013, when some teams shifted resources and allowed us to increase participation. I look forward to seeing the results of efforts by our new finalists and new team."

DARPA will announce the location and date of the DRC Finals in the coming months. DARPA plans to hold the event between December 2014 and June 2015.

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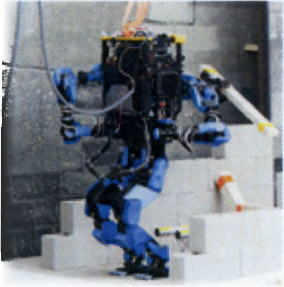
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Images



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Team SCHAFT's robot, S-One, clears debris at the DRC Trials.



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Team KAIST's robot, DRC-Hubo, prepares to turn a valve at the DRC Trials



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Team THOR's robot, THOR-OP, drives a vehicle at the DRC Trials.



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Team ViGIR's robot, Florian, using the Atlas platform

Additional Info

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DRC COMPETING TEAMS

***Qualified Teams**

Due to their participation and scores during the 2013 DRC Trials, the following teams are pre-qualified to participate in the DRC Finals.

IHMC Robotics



Atlas-Ian

Tartan Rescue



CHIMP

MIT



Helios

RoboSimian



RoboSimian

Team TRAC Labs



Hercules

Team WPI-CMU



WARNER

Team TROOPER



Atlas

Team KAIST



DRC-HUBO

Team THOR



THOR-OP

Team VALOR



ESCHER

Team ViGIR



Florian

* Teams are listed in order from left to right based off their 2013 Trials Score

Teams Pending Qualification

Teams that have registered their intent to participate in the DRC Finals are listed below. These teams are not receiving funding from DARPA and will need to qualify in February 2015 for a chance to compete in the Finals.

Team HKU



Atlas

Agent-Morgan



Agent-Morgan

Amity



Amity Robot

FutureBots



ATOM-1.0

Grit Robotics



Cog-Burn

Intelligent Pio...



Intelligent Pioneer

Team ROBOTIS



THORMANG

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The DARPA Robotics Challenge Continues June 2015 in Southern California. U.S., International teams to compete for \$2M prize, June 5-6, 2015, in Pomona, California

From **June 5-6, 2015**, California will be the stage for the **DARPA Robotics Challenge (DRC) Finals**. Teams from around the world will meet at **Fairplex** in Pomona to compete for the \$2 million prize to be awarded to the team that best demonstrates human-supervised robot technology for disaster response.

The DRC is a competition of human-robot systems developed to help emergency personnel respond to natural and man-made disasters. Participating teams from some of the most advanced robotics research and development organizations in the world are designing hardware, software, sensors, and human-machine control interfaces to be tested in a series of tasks selected by DARPA for their broad relevance to disaster response operations.

"Six months ago at the DRC Trials, we began physically testing human-supervised robots against disaster-relevant tasks. Their impressive performance gave us the confidence to raise the bar," said Dr. Gill Pratt, DRC program manager. "A year from now at the DRC Finals we will push the technology even further."

While the tasks at the DRC Finals will be similar to the Trials, a number of new elements will challenge the team's systems:

- Robots will not be connected to power cords, fall arrestors, or wired communications tethers;
- Humans will not be allowed to physically intervene if a robot falls or get stuck—robots that fall will have to do so without breaking and will have to get up without assistance;
- Speed will be more heavily weighted in the scoring, and all tasks must be completed in a total time of approximately one hour (versus four hours in the DRC Trials);
- Communications will be further degraded and intermittent.

Completing the tasks in the time allotted will require innovations on several fronts, including in the human-robot interfaces teams use to control their robots.

"For the first time, teams will be empowered to exploit cloud and crowd-augmented robotics, two highly promising research areas that allow onsite operators to leverage remote data, computing, and human resources," said Pratt. "These research areas are in their infancy, but after the DRC Finals we hope to see significant innovation."

A number of teams were declared finalists at the DRC Trials based on points scored during the December 2013 event, qualifying them for automatic entry into the DRC Finals and, for some, DARPA funding. The first-place finisher, SCHAFT, has elected to withdraw from the Finals to focus on the development of its first commercial product. Another finalist, Team THOR, has since split into two teams; one, Team Valor, remains at Virginia Tech and the other, Team THOR, is now based at the University of California, Los Angeles. All of the finalists except Team KAIST are presently receiving DARPA funding.

The 11 finalists are:

- **IHMC Robotics** (Florida Institute for Human & Machine Cognition, Pensacola, Florida)
- **Tartan Rescue** (Carnegie Mellon University, National Robotics Engineering Center, Pittsburgh, Pennsylvania)
- **Team MIT** (Massachusetts Institute of Technology, Cambridge, Massachusetts)
- **RoboSimian** (NASA Jet Propulsion Laboratory, Pasadena, California)
- **Team TRACLabs** (TRACLabs, Inc., Webster, Texas)
- **Team WPI-CMU** (formerly Team WRECS, Worcester Polytechnic Institute, Worcester, Massachusetts)
- **Team Trooper** (Lockheed Martin Advanced Technology Laboratories, Cherry Hill, New Jersey)
- **Team VIGIR** (TORC Robotics, Blacksburg, Virginia; TU Darmstadt, Germany; Virginia Tech, Blacksburg, Virginia; Oregon State University, Corvallis, OR)
- **Team THOR** (University of California, Los Angeles, California)
- **Team Valor** (Virginia Tech, Blacksburg, Virginia)
- **Team KAIST** (Daejeon Metro City, Republic of Korea)

DARPA expects many more teams to join the DRC Finals competition, including new teams sponsored by the European Union and the governments of Japan and Korea.

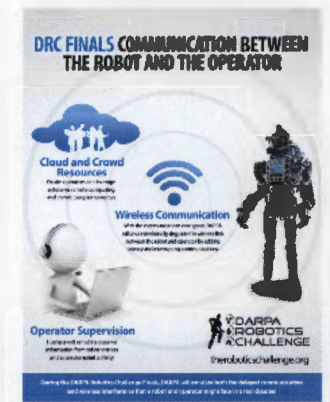
Pre-registration—the first-step for new teams to participate in the DRC finals—is now open on the DRC website (www.theroboticschallenge.org/participate).

Fairplex, the venue for the DRC Finals, is a not-for-profit, public benefit organization with over 480 acres of multi-use event space located near major airports and highways.

More information about the DARPA Robotics Challenge is available at www.theroboticschallenge.org.

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