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Man behind Darpa's robotics challenge: robots will soon learn from each other

Gill Pratt is set to leave the wing of the US defense department that develops cutting-edge technologies but lets us in on what's next for the venerated agency

Sam Thielman in New York

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Gill Pratt invented legs. Well, sort of: the MIT-educated scientist invented electric series-elastic actuators, the technology that carried the bipedal "dinosaur" robots that wowed the scientific community in the early aughts.

Since 2010, he has worked for the Defense Advanced Research Projects Agency (Darpa), the wing of the US defense department devoted to funding and developing new technologies, from a self-steering bullet called Exacto to the packet-switching system, Arpanet, that became the internet. He is now set to leave the robotics challenge program.

Pratt's program at Darpa has been the Darpa Robotics Challenge (DRC), a years-long contest that came to fruition last weekend when three of 25 semi-autonomous robots – "mostly puppets with a little bit of smarts in them", he told a crowd of reporters before the finals – successfully shut down mock nuclear reactors at a fairground in Pomona, California.

The Guardian asked him what's next for robots, and how it feels to be moving on from the DRC.

Guardian: So you've been working toward this moment for years. How do you think it went?

Pratt: The Robotics Challenge, I think, went extremely well. We had three winners, each of which got all eight points, and the overall winner was team KAIST, from Korea. Next in line was the Institute for Human and Machine Cognition, that's IHMC, in Pensacola, and in third place was Tartan Rescue from Carnegie Mellon University National Robotics Engineering Center. All three really performed extraordinarily well, and the fact the third place one fell down and got back up was really, really good.

The public obviously ask you hourly about whether you're weaponizing these robots ...

Yes.

... and you said something a few weeks ago that science is neutral and that you can use any of it for good or for ill. But guys have obviously thought long and hard about what branch of science to try to advance, given that this is the Darpa Robotics Challenge and not the Darpa Mutated Anthrax Challenge. I was wondering how you went about that.

We did it because we think advancing robotics technology can apply to all areas. In general robotics does dull, dirty and dangerous tasks, and it can do that without particulars as to which of the three. For example in disaster response, we did robots for dangerous tasks, but robots that can do dull tasks come from the same technology.

In other parts of defense, it turns out that logistics are by far the greatest part of the cost. It's three quarters of a million to a million dollars a person to support one of our soldiers overseas. The reason is that if you're in a dangerous area, it's very difficult to get supplies to that person and protect them and to take care of them. This has nothing to do with the battlefield: this is just one of our guys in an austere environment in a foreign land. That cost is higher for us than any other military in the world.

A few people in the armed forces we talked to said they were annoyed with Google because so much government money (a $10m, eight-robot contract for the finals) had gone to Boston Dynamics, the company that makes Atlas, and now that Google owns BD, they've said they're not selling to the Defense Department anymore.

Just to be clear, you may have heard that from other folks, but that's actually not what we think. We're very enthusiastic that Google or any other commercial company decides to take our technology and go for it in the commercial world. That works just fine even if the defense budget was used to pay for the high-risk part of it in the early investment that Darpa made.

It would be just the same if NIH (the National Institute of Health) developed a vaccine in the civilian world and it suddenly had an application to protect soldiers in a foreign land where that disease was more prevalent than in the US. Things can cross over from one side to another. We really think that's good, and that it doesn't matter. In particular, when Darpa technology crosses over into the private sector, even if it's not available to defense, what it does is it drives the cost of the products way, way down.

Cellphones are a great example. Often a specialized version of that technology in the civilian sector will then be spun off into the military area. Lots of specialized planes for the DoD are defense versions of a civilian plane. And cellphones these days are now used with specialized apps within defense. The technology in cellphones, from the screens to the processors that are in there, were offshoots of work that Darpa did. So we expect things to cross over back and forth, and we don't mind at all that Google said: "Hey, let's actually run with this thing." We think that it's great.

So last week we had humanoid robots, a few years ago we had self-driving cars at the Darpa Urban Challenge. What's next at Darpa?

There is a Cyber Grand Challenge that Darpa is doing. They're going to do the finals in another year or so. The program manager is a different guy, but it's basically people versus machines, and the challenge is to protect a computer from an attack with malware. So, can automatic software be developed to modify the operating system in a real-time way to protect it against attack, or do high-end programmers have the edge in doing that? And the answer is that we don't know. But it's kind of a neat way for both of them to get better.

Are there other Robotics Challenges coming after you leave?

There may be others. We had a number of workshops on multiple robots, but it's not clear that that's what's going to go forward next. I don't know. We change program managers in my job. You only stay there between two and five years, and so every year or two there's something new that comes up.

Google, Daimler and Uber all have self-driving cars now; how do you anticipate humanoid robots reaching the private sector?

I think the next big thing to conquer is cost. All the prototypes that you saw were in the hundreds of thousands to millions of dollars. And once a market is identified, whether it's in manufacturing or agriculture or ageing society, once someone kind of finds the match between the technology and the market, the costs will go way down, and that will be an amazing thing. The next neat thing that's going to happen is cloud robotics: that's where when one robot learns something they all learn something.

Let's say you have a group of robots used for ageing society and their job is to clean up within your house. As each machine does its work, eventually one of them will come across an object and not know what it is, and it'll reach out to the cloud, through the internet, and say: "Does anyone know what this thing is?" Let's say that no one does. Then it'll reach out to a person and the person will say: "Oh, that's a jar of oil, and that belongs in the cupboard next to the jar of vinegar." And the robot will say: "Got it!" And now every single one of them knows. In this way, you can bootstrap up the confidence of all the machines throughout the world. I think that will be the next technology.

That sounds like robots using the cloud the way reporters use Twitter.

Right, and that's an amazing thing! And it's enabled by the internet, right, so a sort of old Darpa thing feeding into a new Darpa thing and working together. Some of the computation can be done on the cloud, too, so you can offload that so the robot itself doesn't have to burn up the power onboard to do lots of that work.

Are you going to miss this?

I am going to miss it tremendously. [DRC] was an amazing event. An extraordinary dream come true, actually.

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