FEATURE

How Machines Are Learning To Make Up their Own Minds

A Spanish research team is working on a significant breakthrough in artificial intelligence.

By Jason Deign
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Mud swirls through water as an undersea robot tries to find the source of a leak from a deep-sea oil well. But something goes wrong: a piece of metal, unseen in the murk, prevents the 'bot from reaching the damaged area. Unable to complete its objective, the machine gives up.

For machines such as this, which have to operate without orders from their human controllers, dealing with unforeseen circumstances is a problem. The default design solution is to get them to return to base for reprogramming, which costs time and money.

But that is set to change thanks to a team from the Carlos III Universityof Madrid, which is working on how artificial intelligence (AI) can help machines select and prioritize between different tasks, and move on to the next thing on the list if they cannot complete the first.

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In the case of an undersea robot, that means it might be able to complete other useful tasks on site before resurfacing, says Angel Garcıa Olaya, assistant professor at the university. And the process can have applications in other areas, ranging from logistics to tourism.

The team's research, which is critical to the creation of artificial entities recognized as being one of the top 10 technology trendsof the next decade, builds on 20 years of work that has been honed by NASAsince 2004 because of its value for the Spirit and Opportunity Mars rovers.

These machines follow programs that were originally devised before they travelled into space, and are now updated from earth via radio.

If a rover is unable to complete a task, its programming may allow it to come up with an alternative plan of action, but the plan would need to be verified by a human operator. NASA was keen to find out if it could improve upon this process.

The resulting branch of AI focuses creating a simplified plan of all actions, stripping out most of the variables.

The plan is nonsensical in a practical sense—it may assume you can be in two places at once, for example—but it provides a fair idea of the costs of each action, which can then be used to prioritize them.

It is also between three and seven times faster than looking at each action in detail, which makes it useful for situations where time is at a premium.

However, says Garcıa: "Until now this had only been done with plans that had achievable goals. We have added the capacity to use it for goal selection."

Besides helping underwater robots to come up with a 'plan B', the process can help logistics systems to work out the best way to complete a complex schedule of deliveries. One of the team's early backers was a Spanish company with a large and complex distribution network.

The team's work has also attracted interest from IActive, a planning technology spinoff of Spain's University of Granada, which is interested in using AI to develop personalized city guidesthat take into account a user's interests and create an itinerary for them.

Last but not least, the European Space Agencyis keen to use the process to optimize the number of experiments its satellites can perform.

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"We could have this up and running in experimental robots within a year," says Garcıa, "and in submarine robots between one and two years. In areas such as logistics, we could do it now if anyone wants to implement it."

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