

Japanese scientist unveils 'thinking' robot

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Kawada Industries' humanoid robot Hiro pours water into a cup as Tokyo Institute of Technology associate professor Osamu Hasegawa watches, at his laboratory in Yokohama, suburban Tokyo. Hasegawa has developed a system that allows robots to look around their environment and do research on the Internet, enabling them to "think" how best to solve a problem.

Robots that learn from experience and can solve novel problems -- just like humans -- sound like science fiction.

But a Japanese reasearcher is working on making them science fact, with



machines that can teach themselves to perform tasks they have not been programmed to do, using objects they have never seen before.

In a world first, Osamu Hasegawa, associate professor at the <u>Tokyo</u> Insitute of Technology, has developed a system that allows robots to look around their environment and do research on the Internet, enabling them to "think" how best to solve a problem.

"Most existing robots are good at processing and performing the tasks they are pre-programmed to do, but they know little about the 'real world' where we humans live," he told AFP.

"So our project is an attempt to build a bridge between robots and that real world," he said.

The Self-Organizing Incremental <u>Neural Network</u>, or "SOINN", is an <u>algorithm</u> that allows robots to use their knowledge -- what they already know -- to infer how to complete tasks they have been told to do.

SOINN examines the environment to gather the data it needs to organise the information it has been given into a coherent set of instructions.

Tell a SOINN-powered machine that it should, for example: "Serve water".

Without special programmes for water-serving, the robot works out the order of the actions required to complete the task.

The SOINN machine asks for help when facing a task beyond its ability and crucially, stores the information it learns for use in a future task.

In a separate experiment, SOINN is used to power machines to search the Internet for information on what something looks like, or what a



particular word might mean.

Hasegawa's team is trying to merge these abilities and create a machine that can work out how to perform a given task through online research.



Kawada Industries' humanoid robot Hiro drops a mock ice cube into a cup at a laboratory in Yokohama, suburban Tokyo. SOINN examines the environment to gather the data it needs to organise the information it has been given into a coherent set of instructions.

"In the future, we believe it will be able to ask a computer in England how to brew a cup of tea and perform the task in Japan," he said.

Like humans, the system can also filter out "noise" or insignificant information that might confuse other robots.



The process is similar to how people can carry on a conversation with a travelling companion on a train and ignore those around them, or can identify an object under different lighting and from various angles, Hasegawa said.

"Human brains do this so well automatically and smoothly so we don't realise that we are even doing this," he said.

Similarly, the machine is able to filter out irrelevant results it finds on the web.

"There is a huge amount of information available on the Internet, but at present, only humans are making use of such information," he said.

"This robot can connect its brain directly to the Internet," he said.

Hasegawa hopes SOINN might one day be put to practical use, for example controlling traffic lights to ease traffic jams by organically analysing data from public monitors and accident reports.

He also points to possible uses in earthquake detection systems where a SOINN-equipped machine might be able to aggregate data from numerous sensors located across Japan and identify movements that might prove significant.

In a domestic setting, a robot that could learn could prove invaluable to a busy household.

"We might ask a <u>robot</u> to bring soy sauce to the dinner table. It might browse the Internet to learn what soy sauce is and identify it in the kitchen," said Hasegawa.

But, cautions the professor, there are reasons to be careful about robots



that can learn.

What kinds of tasks should we allow computers to perform? And is it possible that they might turn against us, like in the apocalyptic vision of Stanley Kubrick's film "2001: A Space Odyssey".

"A kitchen knife is a useful thing. But it can also become a weapon," he said.

While Hasegawa and his team have only benign intentions for their invention, he wants people to be aware of its moral limits.

"We are hoping that a variety of people will discuss this technology, when to use it, when not to use it.

"Technology is advancing at an enormous speed," he said.

"I want people to know we already have this kind of technology. We want people with different backgrounds and in different fields to discuss how it should be used, while it is still in its infancy."

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