

NEC's cute and friendly R100 robot has lately matured into the more cuddly, commercial mechanical mate, PaPeRo. But when robots finally arrive in the home will they be more *2001* than *Lost in Space*? Martyn Williams takes a look at man's futuristic best friend

The faces of kids and adults alike light up the first time they see Sony's Aibo or Honda Motor's Asimo. They're tickled by the robots' cute demeanour and lifelike movements. That's all very well, but whatever happened to *The Jetson's* ideal of an army of home-help robots to clean up, water the plants and wash the car? So far, the cost of developing robots has meant that they are more suited to entertaining than doing the types of complex work that we do everyday. But now that may be changing.

## NEC's big thing

Several companies in Japan are working on robots that perform simple tasks around the home. One such project has been going on for just over five years in the leafy Tokyo suburbs at NEC's Central Research Laboratory.

The project began when a group of researchers studying a diverse range of applications, such as speech recognition and optical sensing, realised they could put all of this together to build a robot, says Yoshihiro Fujita, senior manager at the lab's personal robot centre.

The first product of the project was the R100, unveiled in August 1999. Almost two years later in March 2001, a smaller, more intelligent successor called PaPeRo was announced.

"It is basically a notebook computer with some sensors, a case and a few motors for movement," said Fujita.

A pair of CCD (charge-coupled device) cameras act as PaPeRo's eyes and it's through these that the robot senses its surroundings and major obstacles. It also allows the robot to recognise up to 10 people. Four microphones act as PaPeRo's ears, three for sound direction detection and one for voice recognition.

PaPeRo's speech interface means it can recognise up to 650 phrases. During a demonstration, PaPeRo recognised Fujita

## In a demonstration, PaPeRo recognised his maker, Fujita, and was able to engage in some small talk before being ordered to take a message

and was able to engage in some small talk before being ordered to take a message. The robot will store this message until he meets the person it was intended for, and then play it back.

Its talents don't stop there. "PaPeRo, switch on the TV," Fujita commanded. A couple of seconds later the television came to life. "NHK," Fujita said – the name of Tokyo's primary TV channel – and PaPeRo switched the channel using an infrared controller buried inside its body.

## Buddy in a bot

Now, none of this is rocket science and the technology wouldn't entice most people to rush out and buy PaPeRo, but it's a taste of things to come. NEC is working towards its goal of producing the ultimate domestic robot: "To partner people in their homes with the underlying aim of improving human-machine interface through introducing robots into our everyday lives."



PaPeRo has already been placed with some 70 families to take part in real-world tests and the results are providing NEC with much needed feedback.

"In the laboratory lighting is very good and engineers know the limitations of the robots so we look at it straight in the face," said Fujita. "At home, there is limited lighting so sometimes half the face is light and half is dark." This, or people looking at PaPeRo from an angle, makes recognition a much harder job and so is a better test of the software.

The trials have also given researchers a chance to see how PaPeRo interacts with pets. "At first, dogs are very wary and they stay at a distance but after a while we find the dogs ignore it," he said.

But despite the trials and constant improvements to software, Fujita fears his work could never end. "I think the project is impossible to complete. People always compare it to a human but its ability is very different. We can keep improving its ability again and again."

For more information on PaPeRo, visit [www.incx.nec.co.jp/robot](http://www.incx.nec.co.jp/robot). ■

