

Watch out, they want dirty work

It is true – robots are coming for our jobs. But they are now mainly after specific kinds – those that are dull, dirty and dangerous, also known as the 3Ds.

Take microbiological testing laboratory Ugene Laboratory Services. It used to have three employees spend their day just weighing food samples and doing simple tests for micro-organisms like *E. Coli* and cholera. But since the company invested in a \$1.5 million robot – highly subsidised by Spring Singapore – the employees have gone on to do “higher calibre” jobs, such as hygiene audits of customers’ factories.

Technical officer Toh Jun An, 24, for example, now does more complicated bacteria identification tests for harmful bacteria like salmonella which cause food poisoning. “I used to do the same thing every day, which became quite boring. Since the robot took over, I’ve been able to learn new skills and gain new experiences,” he says.

Another staff member still spends half his time supervising the robot, but it is something that the company hopes to phase out by upgrading the robot’s capabilities, says its technical director Eunice Ng.

Since November last year, the National University Hospital has been using a \$60,000 stubby red autonomous cleaning robot that has cut the amount of time needed to clean two of its lobbies spanning over 3,000 sq m – equivalent to 27 or so five-room HDB flats – from four to two hours. The Singapore University of Technology and Design (SUTD) is currently developing a robot that can clean glass facades.

Associate Professor Marcelo Ang, director of the National University of Singapore’s Advanced Robotics Centre, describes robots as tools to augment human physical capabilities.

More companies are starting to see this, according to Spring Singapore, which has observed “increasing receptiveness of local enterprises to the adoption of robotics and automation technology”. More food-manufacturing enterprises, for example, have been implementing robotic arms with food preparation and packing and stacking functions, reducing their reliance on rank-and-file workers while increasing efficiency and productivity, says Spring.

However, slowly but surely, the uses of robotics will go beyond the 3Ds. Already two humanoid robots – Pepper and NAO – have been deployed at two pre-schools here in early April on six-month trials, to teach children in interactive ways.

Pepper, which is 1.2m tall with a touchscreen on its chest, has been reading stories to children at My First Skool Jurong Point. The smaller NAO has even been dancing for pre-schoolers at MY World Preschool in Bukit Panjang.

The Paro, a robot baby seal invented in Japan, is being used at nursing homes here. It was designed to soothe, support and

keep people company, and has won the hearts of many elderly persons around the world.

Even the inventor of the most human-like robot developed locally, named Nadine, meant for her to eventually be a personal companion for children and the elderly at home.

Mr Cheong Siah Chong, co-chair of the robotics charter at the Singapore Industrial Automation Association, says robots can technically be used anywhere and for any purpose. “It will be up to us to draw the boundaries and think about the social impact,” he said.

Whether you should leave caregiving to a robot or use one for personal pleasure, these are things we should discuss and think about, he adds.

So far, what is known is that some people get scared when robots look too much like them, says Dr Mohan Rajesh Elara of SUTD.

The phenomenon, known as the “uncanny valley”, was first hypothesised in 1970 by Japanese roboticist Masahiro Mori, who found that while people found robots more acceptable as they became more human-like, that only held true to a certain point. When they looked almost human, people started to feel uneasy and uncomfortable.

“It’s this sudden change in response from positive to negative that is called the uncanny valley,” explains Dr Mohan.

There are researchers studying the phenomenon to understand why it happens, but scientists like Dr Mohan prefer to use less human forms as inspiration, in his case a parrot and a species of huntsman spider. He is developing a companion and surveillance robot modelled after them.

However, there are robotics designers like Dr David Hanson, founder of Hanson Robotics, who is known for designing the most human-like robots, which have synthetic flesh faces and are able to speak and read people’s expressions. Dr Hanson has said in numerous interviews that having a human-like face helps robots communicate more intuitively with humans, through things like body language.

The Straits Times asked 10 Singaporeans if they preferred a human-like robot or one that does not resemble humans. Almost all said they would rather robots looked mechanical or like an animal.

Mrs Clara Wee, 57, a pre-school teacher, says it feels scary to have someone look so much like herself. “It feels as if the robot can rob you of your identity,” she says.

Others felt there was a risk that people could become emotionally attached to humanoid robots, which do not have the ability to reciprocate.

But Mr Arvinraaj K., 33, who works at a call centre, has no qualms interacting with humanoid robots. “It makes them easier to relate to,” he says.

Samantha Boh

Rise of the machines

The global robotics industry is expected to grow from US\$20 billion (\$27 billion) to US\$80 billion by 2025, changing the way we work, how goods are manufactured, how we care for our aged loved ones and how we keep this country safe

SCORPIO

Getting inspiration from the huntsman spider, the Scorpio is a bio-inspired robot developed by Dr Mohan Rajesh Elara and his team at Singapore University of Technology and Design (SUTD). It is a robot built for urban reconnaissance and search-and-rescue missions. It can be operated remotely via a mobile app or be put in full autonomous mode.

Legs

- Each leg is hollow with an internal honeycomb structure so as to stay lightweight without compromising on rigidity
- Powered by servo motors

Body

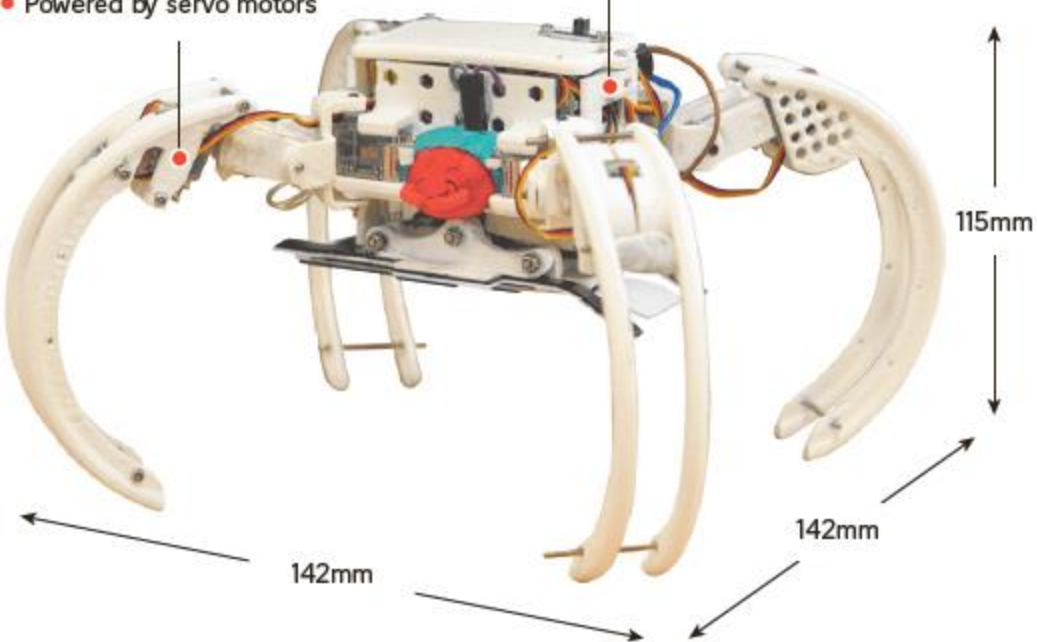
Houses the main controllers, camera and battery

Body material: 3D-printed ABS plastic

Rolling form diameter: 105mm

Weight: 200g

Battery life: 3 days



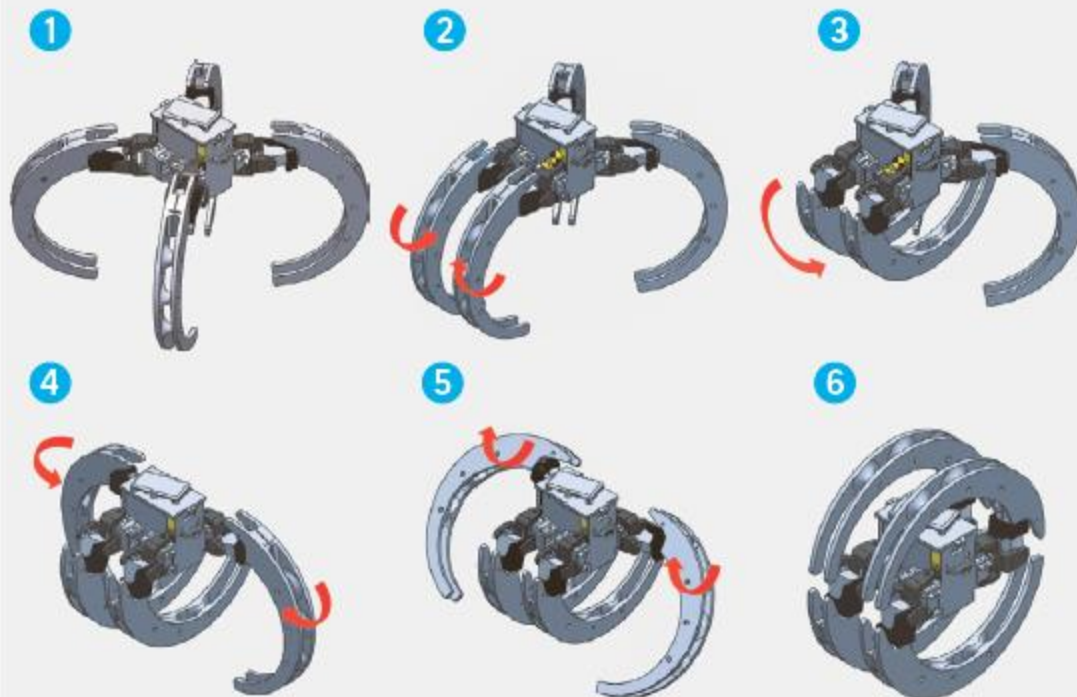
Future developments

- Further reduce the size of the robot
- Make it deployable by throwing it
- Energy awareness to allow prioritising and optimisation of its functions
- Ability to change colour for camouflage purposes
- Mass deployment of multiple robots working together

Reconfigurability

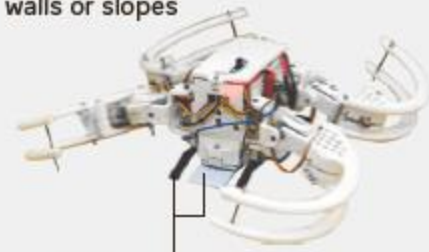
In autonomous mode, the Scorpio uses ultrasonic sensors for navigation and terrain perception. The robot is capable of autonomously assessing the terrain and choosing the most efficient form to take

ROLLING FORM – Form taken to go down slopes or stairs



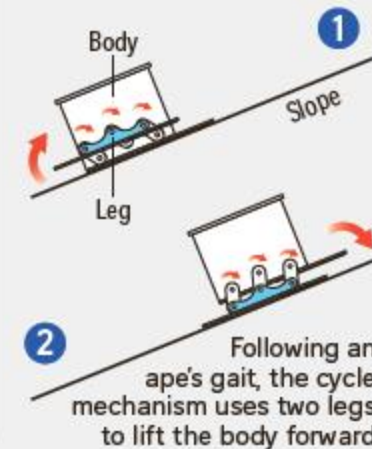
CLIMBING FORM

– Form taken to climb vertical walls or slopes



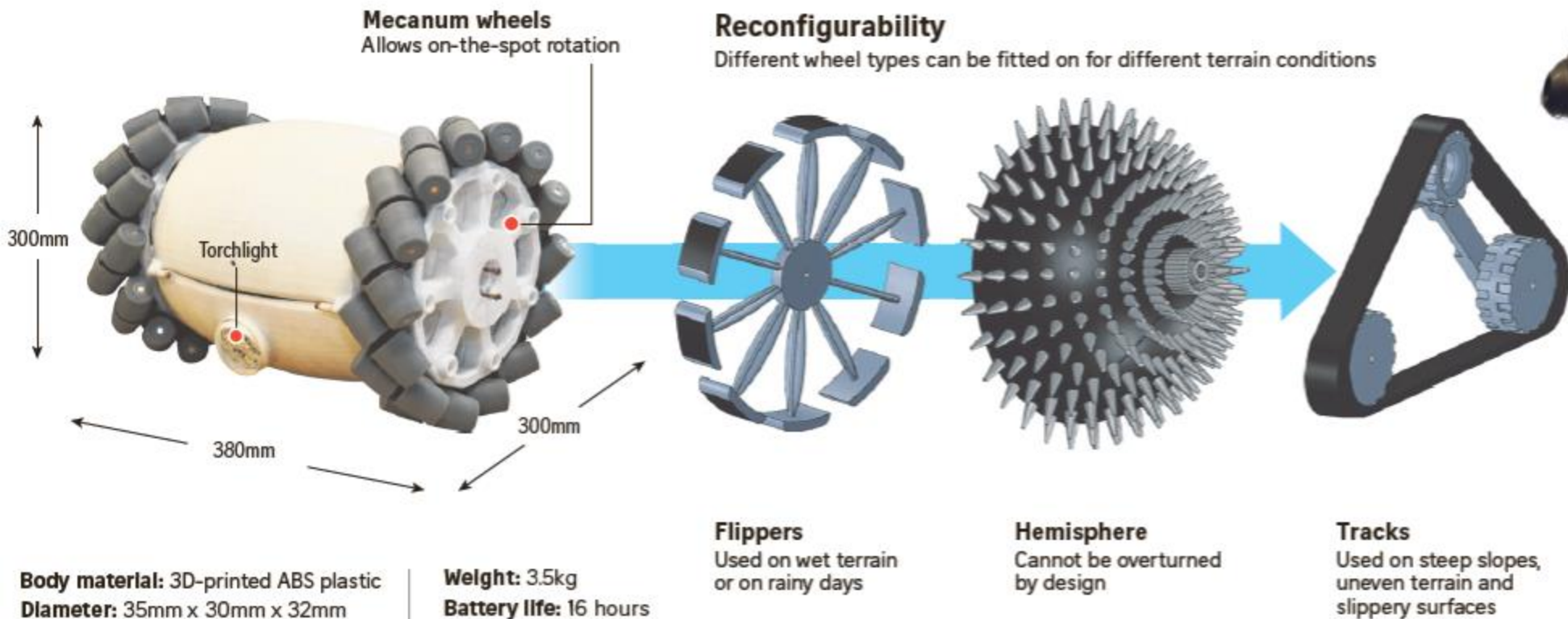
Micro-suction tape

This tape has thousands of microscopic craters in its surface, functioning like micro suction cups



VESURO (Vector Surveillance Robot)

Also developed by Dr Mohan and his team at SUTD, the VeSuRo is a drain-inspection robot designed to move in the narrow drains under housing estates. Its purpose is to detect stagnant water and mosquito breeding. It is operated remotely via a mobile app, with plans of an autonomous mode.



OTHER ROBOTS



Industrial robots

YuMi (left) – short for You and Me – developed by Switzerland-based power and automation group ABB is an example of a collaborative robot that can work safely alongside humans. The dual-arm robot weighs 38kg and can assemble small parts to an accuracy of 20 microns. It is able to handle anything from a watch to a tablet PC, and can be programmed manually, by moving the arms in the way you want it to move, instead of through coding.

Service robots

Robots are being used in hotels, restaurants and hospitals as porters, delivering items including linen, food and medicine from room to room. Techii (right), developed by home-grown start-up Techmetics, weighs 60kg, can work for 13 hours straight, and is able to carry loads of up to 110kg. The robot uses laser sensors installed under it and on its sides to navigate its surroundings and avoid obstacles.

