Rise of the machines

The global robotics industry is expected to grow from US$20 billion (S$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

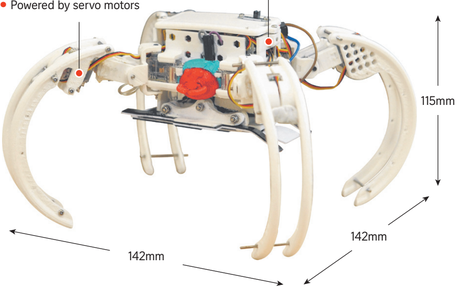
SCORPIO

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



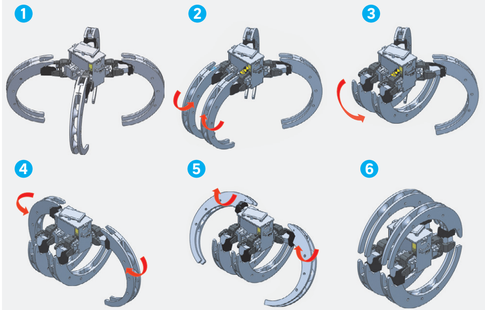
Future developments

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

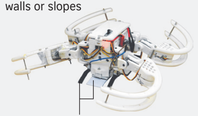
Reconfigurability

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



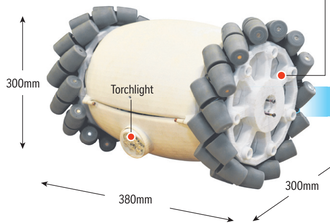
Micro-suction tape
This tape has thousands of microscopic craters in its surface, functioning like micro suction cups

Following an ape's gait, the cycle mechanism uses two legs to lift the body forward

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.

Mecanum wheels
Allows on-the-spot rotation

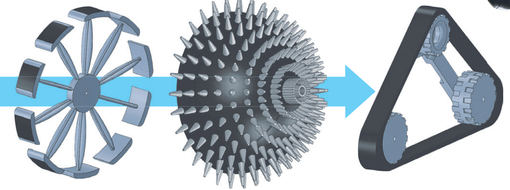


Body material: 3D-printed ABS plastic
Diameter: 35mm x 30mm x 32mm

Weight: 3.5kg
Battery life: 16 hours

Reconfigurability

Different wheel types can be fitted on for different terrain conditions

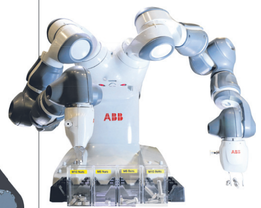


Flippers
Used on wet terrain or on rainy days

Hemisphere
Cannot be overturned by design

Tracks
Used on steep slopes, uneven terrain and slippery surfaces

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. Techi (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.

Sources: DR MOHAN RAJESH ELARA, SUTD Photos: AZMI ATHNI, TIFFANY GOH, SUTD, TECHMETICS, BLOOMBERG STRAITS TIMES GRAPHICS