

# Smallest cyborg insect

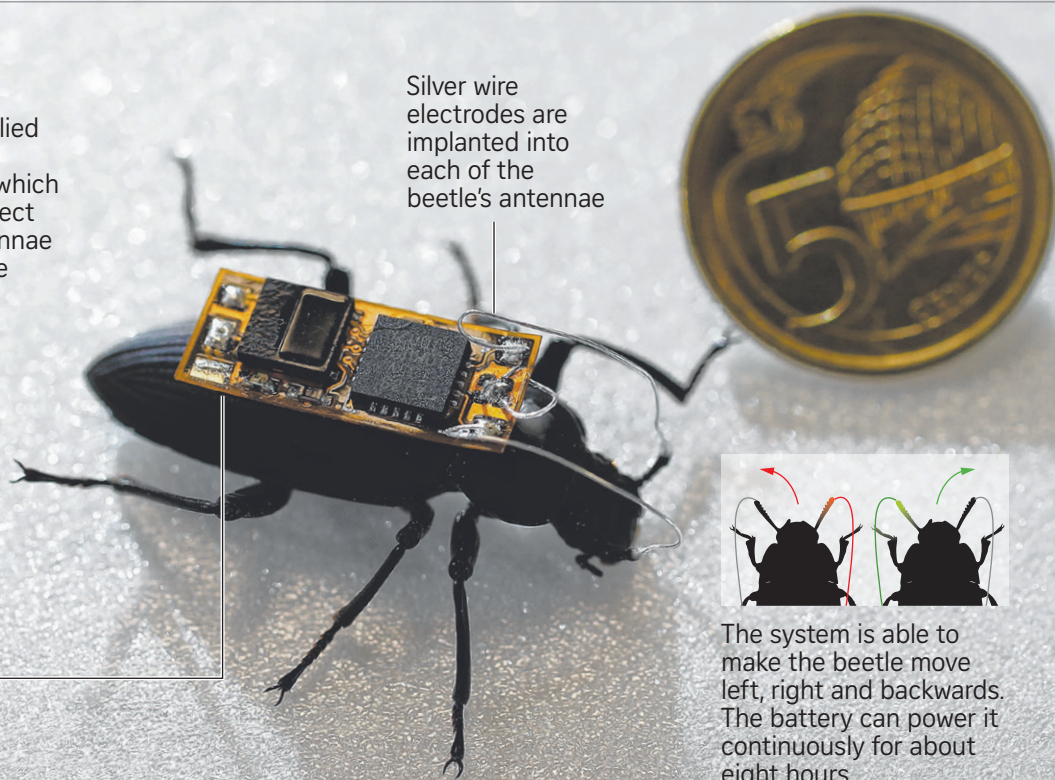
The cyborg beetle developed by Nanyang Technological University researchers is between 2cm and 2.5cm long, and weighs just 1g with its wireless stimulator backpack and two coin-cell batteries. At the core of the backpack is a tiny microcontroller used to control the beetle's movement.

## HOW IT WORKS

Electrical pulses are applied to the insect's antennae through the electrodes, which mimic those that the insect would feel when its antennae touch an object, to cause the insect to turn on its escape mechanism.

The wireless stimulator backpack, and two coin-cell batteries (not pictured) which power it, are glued onto the thorax of the live darkling beetle (*Zophobas morio*) using beeswax.

Silver wire electrodes are implanted into each of the beetle's antennae



## HOW IT CAN BE USED

Due to its small size, the cyborg beetle can be used in search and rescue missions to locate survivors buried under rubble.

The researchers are developing sensors that can be added to the beetle's backpack, to allow it to detect things like carbon dioxide, temperature and the vibration of heartbeats.



The system is able to make the beetle move left, right and backwards. The battery can power it continuously for about eight hours.