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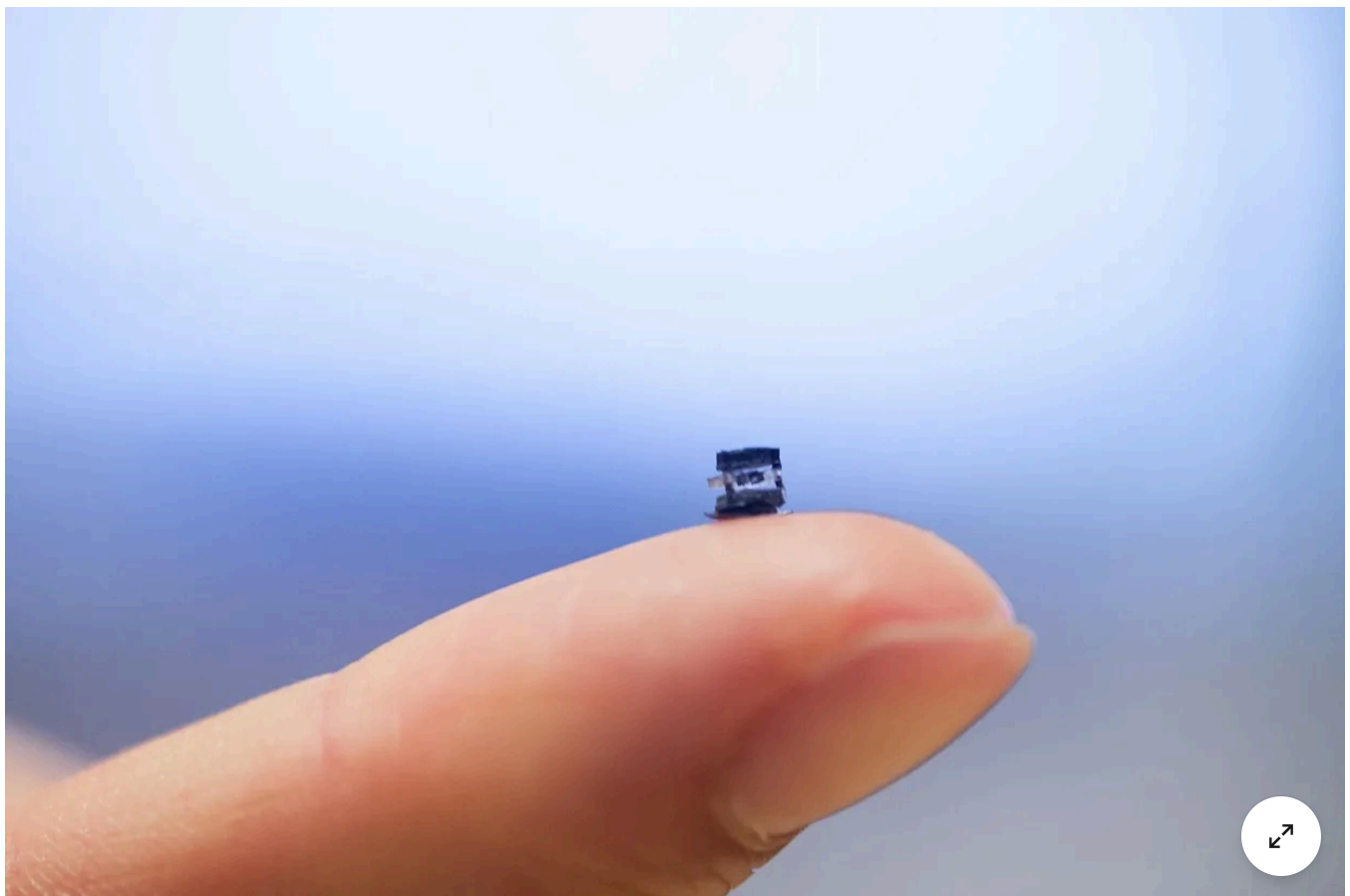
# Tiny robots developed by NTU could be your future surgeon

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Unlike most miniature magnetic robots, which can move in only five ways, the one by NTU is also able to roll.

(PHOTO: NTU SINGAPORE)

SINGAPORE – Researchers from Nanyang Technological University (NTU) have developed a robot just 4.4mm long that could be used to perform minimally invasive surgery, such as biopsies and tumour removal, in the future.

Controlled by weak magnetic fields, the robot can move within the human body, release drugs in a precise location, cut biological tissues, grip and store tissue samples, or generate heat remotely at any one time.

“The robot can further be miniaturised to 1.5mm, which expands its potential to implement a broader range of untethered keyhole surgery,” said Lum Guo Zhan, an associate professor from NTU’s School of Mechanical and Aerospace Engineering, who is the lead researcher of this project.

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He added: “Most magnetic robots like this can perform only one or two functions. Our latest invention can now do five, and our long-term goal is for doctors to use these mini robots in the body, navigate them to a targeted location and use them to perform treatments.”

Unlike most miniature magnetic robots, which can move in only five ways – along three axes, and rotate in two directions – the one by NTU is also able to roll.

This gives it greater control of its position, to better navigate narrow and uneven surfaces in the body.



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The robot can also generate heat inside the body when activated by high-frequency alternating magnetic fields, which could advance magnetic hyperthermia techniques being studied as a way to destroy or weaken cancer cells without invasive surgery.

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“Small-scale robots can potentially increase the efficacy of heat treatments because they can move to very specific locations and provide very localised heating.

“By doing so, we can target the cancer cells that need to be destroyed and ensure that healthy cells are not affected,” Lum said.

The NTU research team tested the robot’s surgical capabilities using biological tissue models such as chicken liver.

Made of soft magnetic materials, the robot’s central module can be reprogrammed in less than a second using magnetic fields, activating different parts independently to change shape and deploy each tool or function.

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Early lab tests have found the materials are unlikely to harm living tissue.

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and NHG Health, the robot could integrate imaging technologies and sensing systems in the future, the researchers said.

On how the robot will be commercialised, Lum said: “In the near term, we aim to deploy our miniature robot for superficial treatments, such as ophthalmology and ear, nose and throat procedures.

“Over the longer term, our vision is to extend its applications to a broader range of organs such as the brain and heart, bringing minimally invasive solutions to complex surgical interventions.”

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Commenting independently, Leonard Yeo, a senior neurology consultant from National University Hospital, said the robot’s small size makes it vastly different from surgical robots currently in use.

“I can envision that they have the potential to replace many aspects of interventional radiological surgery and become a new mode of therapy in medicine,” he said.

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