

Space-age surgery

Drawing on expertise developed from designing precision tools for space exploration, a PolyU team has **ENGINEERED A REVOLUTIONARY MOTORISED ROBOTIC SYSTEM** for minimally invasive surgeries.

Technologies used for exploring the expanses of outer space, and small spaces inside the human body might seem unrelated. But a team at Hong Kong's PolyU has found a link between the two.

In the last 20 years, the need for minimally invasive procedures has driven the rapid development of robotic surgical systems. However, conventional robotic surgery systems are still typically bulky, and require multiple incisions (up to six), offering surgeons limited tactile response.

Led by Yung Kai-Leung, associate head of the Department of Industrial and Systems Engineering, the team exploited their experience in making precision space implements to produce a robotic surgical system that requires just a single incision or none at all.

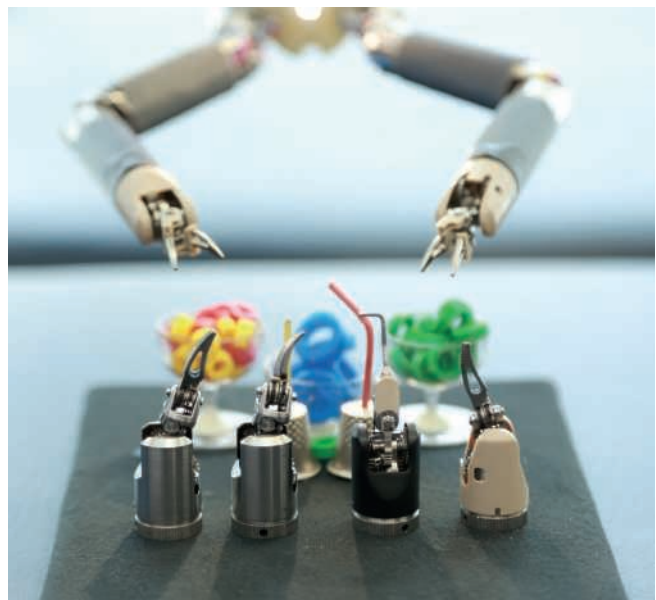
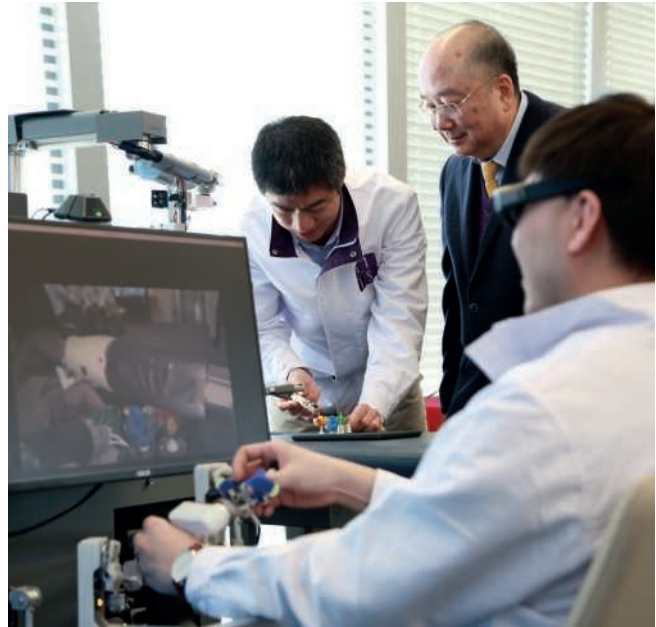
Yung and his group were approached by surgeons from The University of Hong Kong (HKU), who wanted to integrate cutting-edge technologies into a surgical platform to make robotic surgeries safer and less invasive. The ensuing collaborative project was funded by NISI (HK) Limited – a medical device company specialising in non-invasive

surgical technologies, with support from the Innovation and Technology Commission of the HKSAR government.

The project resulted in the Novel Surgical Robotic System (NSRS), capable of single-incision or natural orifice surgeries. It can provide tactile sensation that allows surgeons to operate with great precision and awareness of the force applied to their patients. Doctors in robotic surgery training often feel hindered by the inability to feel the tissues being worked on, says Yung. "Our invention is a significant breakthrough from current systems."

NSRS could eventually perform surgeries through natural orifices, allowing operations without incision. The PolyU team was inspired from the morphing robot from the Transformers film series, which can be taken apart and reassembled. The team applied this concept to surgical robotic arms, fitting them with small-footprint, articulated parts that can be reassembled inside the human body. The capacity to transform means the robotic arms can easily be adapted for different surgical procedures.

The NSRS is also highly portable and can be mounted on any surgical table. It features a 3D camera, and



can be fitted with three or more surgical robotic arms that hold different tools. Each robotic arm is powered by internal micro-motors and capable of up to 7 degrees of freedom, while the whole robotic system is capable of up to 10 degrees of freedom. The motors are similar to those used in the space exploration technologies, small and strong enough for various surgical operations.

The team hopes to use the

NSRS in a range of abdominal and pelvic surgical operations and eventually, significantly improve patient care. "We expect that all surgeries will be highly technologically driven, with robotics as an integral part in future," says Yung. ■

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