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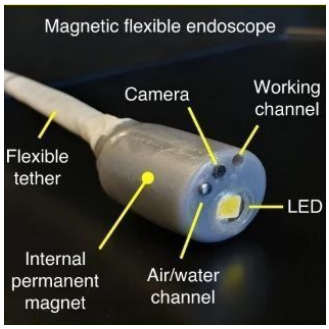
Technology Can Make Endoscopy Safer



Colorectal cancer (CRC) is the third most common malignancy globally, yet more than half of cases are diagnosed late because of excess demand for colonoscopy, the current gold standard for screening. However, a combination of new technologies, such as robotics and computer vision, can help in improving the situation, a new study shows.

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Reduced availability of colonoscopy stems from the outdated design (i.e. unintuitive and not easy to use) of conventional endoscopes, which are also associated with high cost and pain. And as patient diagnosis is delayed, the chance of survival is substantially diminished.

Increasing the availability of early-stage cancer treatments underscores the need for alternative endoscopic technologies. In a new study (Martin et al. 2020), STORM Lab scientists have made improvements on a magnetic endoscope to create a more intuitive and effective endoscopic system. A combination of robotics, computer vision and advanced (autonomous) control was used to develop the system that makes it possible to perform magnetic colonoscopy in vivo, the scientists explained.

"Our contribution to the field of machine intelligence is the ability to explore how different levels of computer assistance may improve the procedure and reduce user workload in robotic colonoscopy," according to the STORM Lab team.

The new robotic magnetic flexible endoscope (MFE) system is equipped with an endoscopic camera and a robotic arm that manipulates an external magnet. Illumination is provided by a light-emitting diode (LED). The endoscopic video feed is then projected on a monitor with a graphical interface showing parameters such as relative robot speed and inter-magnetic distance.

The effectiveness of the MFE system was tested on benchtop and in vivo (porcine models) settings with non-expert users, according to the scientists, which allowed them to further compare the performance and ease of use of different control methods in a living being.

With autonomous navigation enabling the autonomous execution of colonoscopy, this would translate to substantial benefits in terms of reducing mental and physical workload of the operator, "allowing more focus on the clinical aspects of the procedure", the team points out.

The scientists further say their work takes on more significance during this time of global COVID-19 pandemic, when endoscopy practice is being severely restricted by governing bodies. Note that adherence to physical distancing rules poses a big challenge in standard endoscopy, where multiple staff work in close proximity to each other and the patient. In comparison, the MFE and its autonomous control have shown that robotic endoscopy procedures could be performed with fewer staff. Moreover, the scientists point out, minor adjustments to the MFE system (such as a simple tether feeder) can help to further reduce contact between staff and patient.

In addition to colonoscopy, the robotic system can also be used for other endoscopic applications where navigation in unstructured environments is required, such as catheters, pancreatic endoscopy, bronchoscopy and gastroscopy.

Source: nature.com

Image credit: Martin et al. 2020

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