A miniature robotic system for steering and self-propelling within human Digestive Tract

The following pending patented technology is a miniature robotic system, remotely controlled and capable to navigate and safety crawl through a natural tubular lumen such as digestive track (small intestine and colon), by transferring rotational, mechanical motion into sinusoidal wave-like motion.

The Clinical Need

To date, visual examination of the digestive track is been done by either endoscopy, which is an invasive procedure, or by minimal invasive procedure utilizing camera capsule. The small intestine is not accessible to endoscopy while camera capsule can visualize both the colon the small intestine but has some other limitations such as slow movement due to dependency on peristaltic motion of the digestive tract meaning that the physician can not examine the patient onetime due to the prolonged procedure. In addition, capsule retention is the most feared complication, which eventually required a surgical intervention. The capsule currently lacks the ability to manage (forward / backward and speed), accurate investigation and dissection if necessary. Abnormalities in some areas of the intestine are missed because of rapid transit of the capsule and blurred, uninterruptible photographs. It is not possible to obtain samples via capsule endoscopy. If the capsule identifies an abnormality, the gastroenterologist will not know until the video is reviewed, usually at least several hours later. The gastroenterologist cannot stop the capsule, extend a biopsy forceps, and obtain a sample. Thus, the gastroenterologist is relying solely on visual cues to make a diagnosis. *There is a clear need for a miniature robotic system, remotely controlled and capable to navigate and safely crawl thought the digestive track (including the small intestine) by carrying a minimum payload for visualization and investigation tasks.*

The solution and current development Stage

A miniature robotic system was developed and analysis of wave-like locomotion over flexible surfaces has been carried out. This wave-like locomotion resembles a continuously advancing wave and is been generated by a continuous wave utilizing only one single motor. The system transfers rotational motion into sinusoidal wave-like motion by plurality of discrete connected hollow elements and a helix shaped elongated rod passing there through. When the spins around its central axis the discrete hollow elements tale the form of a advancing wave. Further in vitro studies will carry out during Q4/2017.

The market opportunity:

Recent research shows that the current market size of the capsules is about $ 500 million and is expected to grow by 9% per year. When adding new capabilities to the current passive capsules, the use of capsule will increase because it will be more attractive since it will combine many other missing features such as: steering capabilities and carry on payload such as camera and a biopsy forceps for closer inspection and dissection capabilities.

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