

FYP: Development of A Active Endoscope Based on Concentric Tube Robot

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Background

A continuum concentric tube robot (see Fig. 1) is formed by inserting super-elastic tubes concentrically into each other. The concentric tubes are initially designed as active cannulae for use in minimally invasive surgeries (MIS). On potential application is to use the concentric tube robots as endoscope holders. The highly-manuverable tips of the concentric tube robots provide much superior performance in positioning accuracy and angle of view when compared to the passive endoscopes. The functioning of such active endoscope requires the cooperation of a passive endoscope and the concentric tube robot, where an approach must be found so that the two components do not compromise the functioning of each other.

Problem

The shape of a concentric tube robot will be affected by the endoscope that goes through it. Such effect must firstly be explored. Counter measures must be designed, so that the effect can be either minimised and become negligible. Alternatively, additional measures can be applied to cancel out the effect. On the other hand, since the concentric tube robot relies on rotation to control its tip position and orientation, an image processing controller must be developed, so that the rotation of the image captured by the endoscope is eliminated. Also, the rotation may have negative impact on the mechanical structure of the endoscope, which must be taken into account.

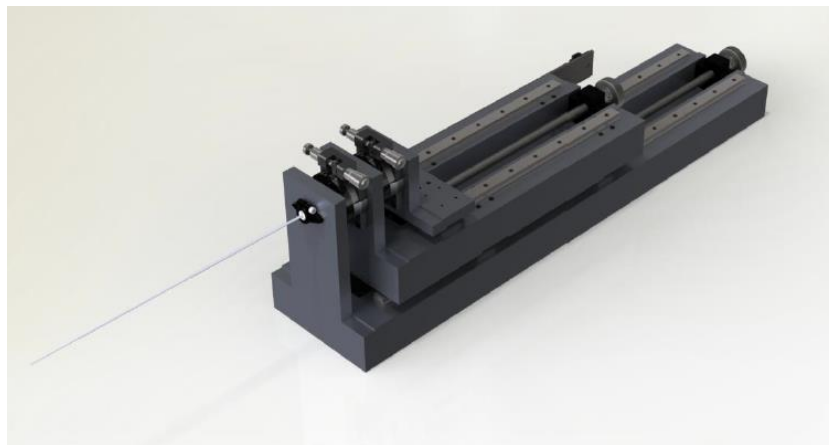


Fig. 1. A concentric tube robot prototype.

Objective

To explore the optimum approach to enable active endoscope with concentric tube robot:

1. Evaluate the effect of an endoscope on the shape of concentric tube.
2. Generate optimum solution to eliminate the effect and achieve precise control of robot.
3. Develop an image processing controller to cancel the rotation of endoscope image.

Requirements

One student in Mechanical, Mechatronics, or Aerospace

Contact

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