

SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Motorised soft-robotic retractor for effective laparoscopic colorectal surgery

The aim of the project is the development of an optimal design, fabrication and efficiency testing of a soft-robotic retractor for laparoscopic colorectal surgery. A soft retractor is desired to be operated with biocompatible materials with their compliant properties enabling safe interaction with human body.

Globally, approximately 1 million people are affected by colorectal cancer each year. The crude rate of mortality is 50%. Carrying out a colectomy is one of the effective treatments to deal with colorectal cancer at an early stage. In laparoscopic colorectal surgery, retraction of tissues to obtain adequate visualisation of the surgical field is more challenging due mainly to the long distance involved, narrow instruments used, and loss of haptic feedback. Typically, retraction is a crucial part of surgery which plays the role of holding, pushing tissues and establishing area for operation during surgical procedures. In commercial retractor models, the end-effectors are in different shapes such as poly-articular pole, broad paddle and multi-fan blades. Most of the end-effectors have only one degree of freedom which can only open in a plane. Because of the limited movements, the end-effectors cannot keep the rest of intestine away from the working space. This investigation aims to develop a soft-robotic retractor assisting colorectal surgery overcoming the limitations of the currently available retractors.

2. Project Scope

Design and fabrication of an advanced retractor using a soft-robotic approach, with a hand holding shape

Fitting the retractor with an adjustable motorised hand-holding angle that can push away obstacles without repositioning the entire retractor

Development and implementation of sophisticated control approaches for the retractor to be controlled inside human body in real-time with a robotic manipulator.

3. Desired Skills from the Student

Basic knowledge in Engineering design and Instrumentation

4. Supervisory Team

Primary: Dr M Hasan Shaheed

Secondary: Professor K. Althoefer

Additional: Dr Mo Thaha