Development of an Automatically Adjustable Colonoscope

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Colonoscopy can be associated with many problems, such as mechanical trauma due to the distal tip contacting the colon wall or health issues due to the extended use of anesthesia. In order to eliminate these complications, an automatically adjustable colonoscope was designed. This device uses sensors, actuators, and a control system to automatically position the distal tip in the center of the colon lumen. The sensors were tested to determine their ability to accurately sense the distance from the tip to the surface of a white PVC tube. The actuators were tested to determine the correlation between motor rotation and displacement of the distal tip. The control system was tested to assess the ability of the device to position the tip in the center of the test tube and the ability to navigate through a flat test course. It was determined that the sensors could accurately determine distances from 0 mm to 15 mm from the test surface in all test conditions. The motors for up-down movement and left-right movement of the colonoscope had response times of 0.57 s and 0.69 s, respectively, when the motors were rotated from 0 deg to 90 deg. The control system was able to safely move the colonoscope tip away from all walls of the test apparatus. It was also able to navigate through the flat test course without coming in contact with the walls. The automatically adjustable colonoscope has demonstrated that it can safely and effectively position the distal tip to avoid contact with the walls of the test surface.

Localization of the Distal Tip in the Colonoscopy Training Model Using Light Sensors

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Colorectal cancer is one of the commonly occurring types of cancer and individuals above 50 years of age are considered at a high risk. Everyone is suggested to undergo full colonoscopy every 10 years. Training medical students by operating on patients directly is not safe and not comfortable for the patients. Hence, a training model is being developed to train medical students. In the training sessions, if student gets information regarding the distal end of colonoscope, he can prepare and plan his future moves and he also gets the information concerning the diseased part of the colon. This information also helps the student if he requires inserting a surgical tool along with the colonoscope. In the present study, the distal end of colonoscope is localized using photocells. The colonoscope has a light source for the camera at its distal end. These photocells are connected in basic comparator circuit. The photocells are fitted at specific locations on rubber colon, whose voltage changes on reception of light beam. The photocells are interfaced with a data acquisition system, using which data are acquired. While tracking the distal end, noise created in some photocells at particular instant yields misleading information. In order to avert such occurrence, an algorithm is written separately for advancement and retraction. Using these data, distal end is accurately localized and also specific time required during the test, to pass the colonoscope through specific parts of colon for further analysis.