Detection of Colonic Landmarks and Features for Supine-Prone Registration

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Introduction

- In Virtual Colonoscopy, CT scans are typically acquired with patient in both supine and prone
- Colon is flexible and changes substantially with change in patient's position
- Supine-prone registration can be used to toggle between supine and prone to confirm polyps
- Certain anatomical landmarks and features are necessary for supine-prone registration
- Registration is helpful in virtual navigation and dissection, polyp bookmarking, polyp matching
- We present methods for detecting anatomical landmarks (e.g., taeniae coli, flexures) and for detecting geometric feature points
- Our methods are theoretically sound; we have tested them on different colon datasets with very good results

Detection of Flexures

- Colon centerline is detected
- Centerline is projected onto a 2D coordinate system in positive z-x and y-z planes
- Bends in the centerline are identified by iteratively evaluating the slopes along the projected curves in the two planes
- Major bends are retained by thresholding
- Bends are sorted based on the z-coordinate
- Splenic flexure identified as the bend with highest z-coordinate
- Hepatic flexure identified as the bend with second highest z-coordinate
- Two other major flexures between the descending colon and sigmoid and between the sigmoid and rectum are identified similarly

Detection of Features

- Colon surface opened up along the taeniae coli and flexures to obtain 5 anatomical flat segments
- For each flat segment, images are obtained by color encoding the mean curvature

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