Segmentation of Crohn, Lymphangiectasia, Xanthoma, Lymphoid hyperplasia and Stenosis diseases in WCE

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Outline

1. Wireless Capsule Endoscopy
2. The registration procedure
3. The previous studies
4. The proposed method
5. The results and comparison
WCE history

- 1999: Capsule endoscopy introduced by Gavriel Iddan
- 2001: Capsule technology FDA approved in the United States
What is the Wireless Capsule Endoscopy?

* Non invasive and without pain

* Investigates GI and small bowel
How are the videos registered?

* 8 recording electrodes collect RF signals.
What is the WCE’s software?

- RR (Rapid Reader)
- Endo view
What is the problem?

- 2 to 60 frames per second
- 8 to 12 hours recording
- More than 55,000 frames (at least)
- Time consuming
- Difficult to physician to investigate diseases

We will propose a method which is able to find diseases region in a frame.
M. Mackiewicz (2008) proposed an automatic video segmentation algorithm to discriminate the esophagus, stomach, small intestine, and colon tissue in WCE, using color, texture, and motion information.

B. Li (2009) used a new feature, chromaticity moment, which makes use of the Tchebichef polynomials and the illumination invariant of HSI color space, was proposed to discriminate normal regions and abnormal regions of WCE images.

B. Li (2007) developed an adaptive curvature strength diffusion method to enhance WCE images using a new concept of curvature strength.

S. Bejakovic (2010) used the mean-shift algorithm to find centers of candidate regions that may show Crohn’s disease inflammation. Then, the system was classified by a trained Support Vector Machine. Accuracy, specificity and sensitivity were reported 87%, 93% and 80% respectively.
The proposed method

- Hue channel can omit some normal region
- The saturation and the value channels improve sigmoid function’s results
- The sigmoid function is used to select light parts (higher intensity)
- Diseases were segmented by using of the Canny filter
In a comparative study, we classify the normal and diseases region by using fuzzy c-means clustering into two groups, and then compare the results with the proposed method.

Also, we compare the results with the Canny’s edge detector without using any enhancement and show how this method improve segmentation.

The Accuracy, Sensitivity and Specificity are used to compare methods.
Future studies