HOOKWORM DETECTION USING WIRELESS CAPSULE ENDOSCOPY IMAGES

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ABSTRACT

The main aim of this project is to capture the properties of hookworms, GLCM technique is first applied to detect the location of hookworm and then the Guided Filter is used to reduce the distortion. To differentiate the unique visual features of hookworm from different components of gastrointestinal structure, Morphological operation is been proposed to locate their exact tubular structure. Wireless capsule endoscopy (WCE) has become a popular diagnostic technique to examine inflammatory bowel diseases and disorders. As one of the most common human helminths, hookworm is a kind of small tubular structure with grayish white or pinkish semi-transparent body, by which a number of 600 million people are infected around the world. Hookworm detection is a difficult task due to poor image quality, presence of extraneous matters, typical structure of gastrointestinal, and diverse appearances in terms of color and texture. The resultant images in the proposed approach achieves a outstanding performance. Moreover, sensitivity will be high in detecting hookworms indicates the potential of our approach for future clinical application.

Keywords: - *GLCM ,Guided filter, WCE*

1. INTRODUCTION

Hookworms can be found in approximately 25% of the world's population. The most common species are *Ancylostoma duodenale* and *Necator americanus*. Both species are widely distributed in Asia and Africa but can also be found in other tropical and subtropical zones between 45ºN and 30ºS latitude. The life-cycle begins with the penetration of infective filariform larvae through the skin, usually through bare feet. Larvae are then carried by the bloodstream into the lungs where they penetrate the alveolar wall and ascend the respiratory tree into the pharynx. They are then swallowed and mature into adult worms in the small bowel, particularly the jejunum. Adult hookworms are 5 mm to 13 mm in length and produce between 5000 and 25 000 eggs per day. The identification of hookworm species relies on microscopic evaluation of adult worms, particularly the characteristics of the oral

opening. There are also species differences in relation to worm size, worm survival, egg production and degrees of gastrointestinal damage and blood loss. Most people have light infections and are asymptomatic. However, heavy infections can result in abdominal pain, anorexia and diarrhea as well as iron-deficiency anemia. The latter is caused by occult bleeding induced by mucosal damage and the secretion of anticoagulants by the worm.

Hookworm infections are normally diagnosed by the detection of eggs in feces. Several antihelminthic drugs are effective including albendazole, mebendazole and pyrantel preparations. Hookworms are estimated to infect more than 740 million people around the world, but most people who are infected are asymptomatic. Hookworm usually lives in the upper part of small bowel. Iron deficiency anemia secondary to loss of iron into the gut is the most significant risk of hookworm. Diarrhea, chronic abdominal pain, anorexia and weight loss are also frequent symptoms seen. The prevalence of infection is as high as 80% in tropical areas within developing countries, and only 20% in drier climates. Definite diagnosis is made by seeing hookworm eggs during stool examination, however sometimes its diagnosis can be missed. Wireless Capsule Endoscopy (WCE) has become a powerful tool to identify small bowel pathologies such as Crohn's Disease, Arteriovenous malformations (AVMs), polyps and tumors when other diagnostic measures have been unyielding. Hookworm infestation of small bowel on WCE was reported in the adult population but not in children. The purpose of this case report is to alert other physicians that small bowel hookworm infections could be incidentally found on WCE even in nonendemic areas and should be considered in children presenting with iron deficiency anemia.

2. RELATED WORK

1)Computer-Aided Bleeding in WCE Video

Yanan Fu, Student Member, IEEE, Wei Zhang, Member, IEEE, Mrinal Mandal, Senior Member, IEEE, and Max Q.-H. Meng, Fellow, IEEE VOL. 18, NO. 2, MARCH 2014.

In this paper, a new method for rapid bleeding detectionin theWCE video is proposed. We group pixels through superpixel segmentation to reduce the computational complexity while maintaining high diagnostic accuracy. Feature of each superpixel is extracted using the red ratio in RGB space and fed into support vector machine for classification. Also, the influence of edge pixels has been removed in this paper.

2) Detection of Small Bowel Polyps and Ulcers in Wireless Capsule Endoscopy Videos

Alexandros Karargyris and Nikolaos Bourbakis, Fellow, IEEE VOL. 58, NO. 10, OCTOBER 2011*

This paper proposes a novel synergistic methodology for automatically discovering polyps (protrusions) and perforated ulcers in WCE video frames. Finally, results of the methodology are given and statistical comparisons are also presented relevant to other works.

3) Automated Polyp Detection in Colon Capsule Endoscopy

Alexander V. Mamonov, Isabel N. Figueiredo, Pedro N. Figueiredo, and Yen-Hsi Richard Tsai VOL. 33, NO. 7, JULY 2014*

This paper proposes an algorithm that relieves the labor of a human operator analyzing the frames in the video sequence. The algorithm acts as a binary classifier, which labels the frame as either containing polyps or not, based on the geometrical analysis and the texture content of the frame.We assume that the polyps are characterized as protrusions that are mostly round in shape. Thus, a best fit ball radius is used as a decision parameter of the classifier.

4) **Tumor Recognition in Wireless Capsule Endoscopy Images Using Textural Features and SVM-Based Feature Selection**

Baopu Li and Max Q.-H. Meng, Fellow, IEEE VOL. 16, NO. 3, MAY 2012

This paper addresses the problem of automatic recognition of tumor for WCE images. Candidate color texture feature that integrates uniform local binary pattern and wavelet is proposed to characterize WCE images. The proposed features are invariant to illumination change and describe multiresolution characteristics of WCE images. Two feature selection approaches based on support vector machine, sequential forward floating selection and recursive feature elimination, are further employed to refine the proposed features for improving the detection accuracy.

3. EXISTING METHODOLOGY

To capture the properties of hookworms, the multi scale dual matched filter is first applied to detect the location of tubular structure. Piecewise parallel region detection method is then proposed to identify the potential regions having hookworm bodies. To discriminate the unique visual features for different components of gastrointestinal, the histogram of average intensity is proposed to represent their properties. In order to deal with the problem of imbalance data, Rusboost is deployed to classify WCE images.

4. PROBLEMS IN THE EXISTING SYSTEM

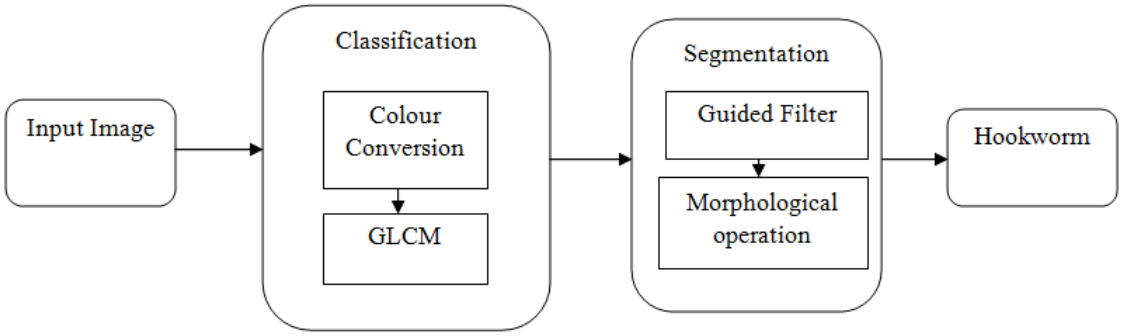
The method is fails to recognize that boundary is smooth.It can be suitable for simple statistical model

5. PROPOSED WORK

In this project by observing its unique properties, we propose serials of novel techniques to capture its characteristics, aiming to reduce the number of images a clinician needs to review. Experiments from different aspects demonstrate that the proposed method is a robust classification tool for hookworm detection, which achieves promising performance. The contributions of this work are as follow, Guided filter is used to enhance the image, Guided filter is non-iterative, fast, accurate edge preserving filtering. The guided filter computes the filtering output by considering the content of a guidance image, which can be the input image or another different image. Guided filter uses the color images for implementation because color guidance image can better preserves the edges that are not distinguishable in gray-scale Gray Level Co-occurrence Matrix (GLCM) is proposed to Classify the hookworm

images, whether hookworm is present or not in WCE images. The Morphological operation is used to the segment the Hookworm.

5.1 BLOCK DIAGRAM:



5.2 BLOCK DIAGRAM EXPLANATION:

5.2.1COLOUR CONVERSION:

In photography and computing, a grayscale or greyscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum .

5.2.2 GLCM:

The Gray Level Co-occurrence Matrix (GLCM) and associated texture feature calculations are image analysis techniques. Given an image composed of pixels each with an intensity (a specific gray level), the GLCM is a tabulation of how often different combinations of gray levels co-occur in an image or image section. Texture feature calculations use the contents of the GLCM to give a measure of the variation in intensity (a.k.a. image texture) at the pixel of interest. A statistical method of examining texture that considers the spatial relationship of pixels is the gray-level co-occurrence matrix.

5.5.3 Guided Filter:

The guided filter function performs edge-preserving smoothing on an image, using the content of a second image, called *a* guidance image, to influence the filtering. The guidance image can be the image itself, a different version of the image, or a completely different image. Guided image filtering is a neighbourhood operation, like other filtering operations, but takes into account the statistics of a region in the corresponding spatial neighbourhood in the guidance image when calculating the value of the output pixel.

5.5.4 Morphological Operation:

Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. Morphological operations rely only on the relative ordering of pixel values, not on their numerical values, and therefore are especially suited to the processing of binary images. Morphological operations can also be applied to greyscale images such that their light transfer functions are unknown and therefore their absolute pixel values are of no or minor interest.

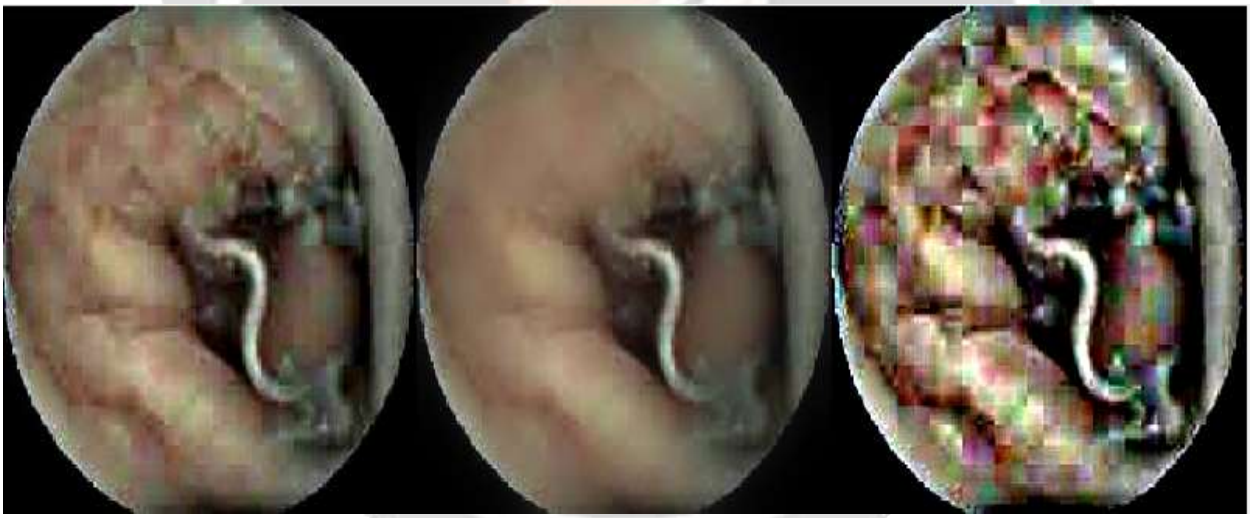
6.SIMULATION RESULT:

Input image

Grey Scale Conversion

GLCM

Guided Filter



Output image

6.CONCLUSION:

In this project clear and the exact detection of hookworms in the intestines has been proposed. The main advantage of this method lies in that the method can recognize detects hookworms and excludes the unnecessary detection of the non hookworm regions. Experimental results shows that our detection method yields a good performance. This project has been done by image processing using matlab. This system consists of feature extraction and segmentation by using GLCM algorithm , specifically by Guided filter. The values of the existing system can be compared with the values that are obtained from the proposed system .

7. FUTURE WORKS:

In our project we are detecting the exact location of the hookworm using the GLCM algorithm and displaying it clearly with the help of Guided filter. Further this project can be extended to detect various intestinal disorders using various algorithms and filters for clearer view.

8. REFERENCES

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