

# Recognition of Diseases in Human caused by Worms via Wireless Capsule Endoscopy

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## Abstract:

Parasitic diseases in human caused by intestinal helminthes are the most prevalent diseases in human in developing countries. Intestinal parasites cause a significant morbidity and mortality in endemic countries. To view the whole gastrointestinal tract, wireless capsule endoscopy (WCE) has been used. This is the first minority works to systematically explore the routine recognition of diseases of worms in human using WCE. To confine the properties of worms, the connected component algorithm is first applied to partition an image into segments and Region props is used to measure the properties of worms from segmented image. Supervised learning technique is deployed to classify the WCE. To classify the worms, K-nearest neighbor technique is then proposed. Experimental results shows the overall performance and the time reduction.

*Keywords* — **worm; wireless capsule endoscopy; Computer-aided detection; worm classification.**

## 1. INTRODUCTION

Climatic factors, limited hygiene, and a variety of daily activities including eating habits and obtaining water all contribute to a spectrum of infections caused by worms. All these infections are more common in subtropical and tropical regions and many have cutaneous features [1]. Ascariasis is the most common human worm infection, with about 1.25 billion individuals affected worldwide. Most infections are spread by the presence of eggs on poorly washed vegetables or from soil contaminated with feces and eggs [2]. Direct spread from human to human is rare. The eggs become infective after several days and remain so for many months. Hookworm disease is the second most common worm infection, estimated to involve over 1 billion people worldwide [3]. It was formerly very common in the USA, particularly the southeast, but increased hygiene has made it less of a problem [4]. Transmission is from fecally contaminated soil. The eggs hatch into larvae which then can penetrate the skin, entering their new host. Thus, the problem is greatest in rural societies where people go barefoot and feces are either used for fertilizer or easily encountered about the home [5]. The whipworm is another intestinal nematode spread by the fecal-oral route, usually via contaminated vegetables. It is a very common disorder, involving about 700 million people worldwide [6]. The 3 - 5 cm adult worms are attached to the cecum or rectum, where they cause a variety of symptoms including bloody stools, abdominal pain, and even rectal prolapse, where they may be easily seen. In chronic childhood infections, severe anemia and even hypoproteinemia and growth retardation may also occur. Cutaneous findings are limited

to an occasional urticarial reaction. Diagnosis is by examination of stool for ova and parasites. The treatment of choice is mebendazole [7].

Wireless capsule endoscopy (WCE) is a throwaway exhibit great variation in morphology and color. The worms attaching on mucosa exhibit different shapes, widths and bend orientations [8]. These challenges pose a great complexity for routine worm disease recognition in WCE. The remains of this paper is prepared as follows: section II introduces our proposed algorithm. Experiment and results are shown in section III. Finally, in section IV, we compose a wrapping up and consider the future work.

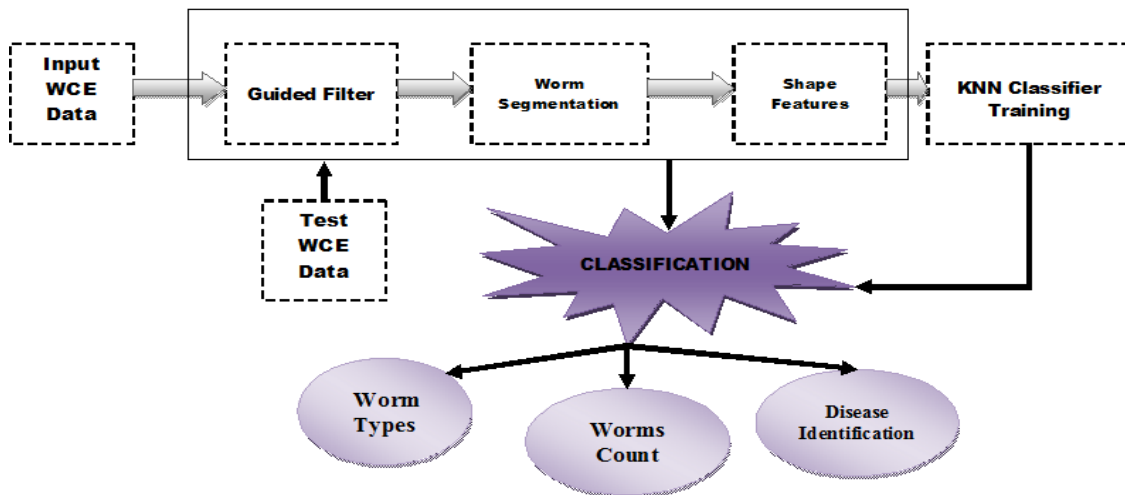
## 2. METHODOLOGY

The proposed methodology has four steps of process to classify the worms. Guided filter is applied as pre-processing step, to segment the worm region multi threshold and quantization algorithms applied. Shape features are extracted in third step. Finally it will be trained in KNN classifier. Then testing will be done to classify the worm types, worm count and diseases in worms. Figure 1 shows the overall architecture of the system.

### GUIDED FILTER

In human image observation, edges afford an efficient and animated stimulation to facilitate the neural understanding of a scene. Superior weights are assigned to pixels at edges than pixels in flat areas. There are numerous methods to work out the edge-aware weighting. In a guidance image, 3x3 window of pixel contains local variance is applied to figure the edge-aware weighting. The weighting can be simply computed using the box filter intended for every pixels in the guidance image. The local variance of a pixel is normalized by the local variances of every pixel in the guidance image. The normalized weighting is then adopted to design the WGIF. Guided filter is mainly used for image enhancement.

The guided image filter is based on a local linear model. The guided filter delivers the output by taking into consideration of reference image. The reference image is also called as guidance image which can exist as input image itself or a different image. The guided filter has enhanced edge preserving smoothing and gradient preserving property.



**Fig 1: Overall System Architecture**

## **SEGMENTATION**

### **1) Multilevel Thresholding**

It extracts the required part of the image and display as a white part.

### **2) Vector Quantization**

It is an image compression parameter that uses only the vector. It is used to map a group rather than one at a time. The groups are provided as input and produce them as reproductive vectors.

## **3.FEATURE EXTRACTION USING REGION PROPS**

### **Connected Component Labeling**

Connected-component labeling is a vital task familiar to almost each image processing operation within two and three extent. Connected component labeling mainly used for assigning labels to the BLACK image elements. The same label can assign all the adjacent BLACK elements. In this, “adjacent” signify 4 or 8-adjacent.

Connected-component labeling can be characterized as a alteration of a binary input image B into a typical image S such that,

- (1) Every image essentials contain value WHITE in S and,
- (2) Each maximal connected separation of BLACK image elements in S is labeled with a distinct optimistic digit in S.

A twofold image decides a chart, into which the nodes are the BLACK image elements and the ends equal to combination of neighboring BLACK image component. The components of the image might be skillfully labeled by a depth-first component labeling approach, if the image able to go inside memory, plus the illustration of the image does not maximum the order into which ends might be visited. However, a few image illustration schemes may not be suitable. For example, huge pixel pattern are stored in raster order; otherwise it can be stored in pointer less quad-tree representations.

Foreground/background segmentation of a photograph is an intrinsically vague problem. First, it restricts the consideration of the segmentation process to the internal of the bounding box. This belongings is easy to integrate keen on several method, individual be able to assign every outer element toward the ‘backdrop’ group. The next property is greatly tough to integrate or still on the way to make official. Unofficially, it suggest as: “customer can afford bounding boxes to facilitate not also free, but are suitably tight”, or in other words, the preferred segmentation should have items that are adequately locked to every surface of the bounding box.

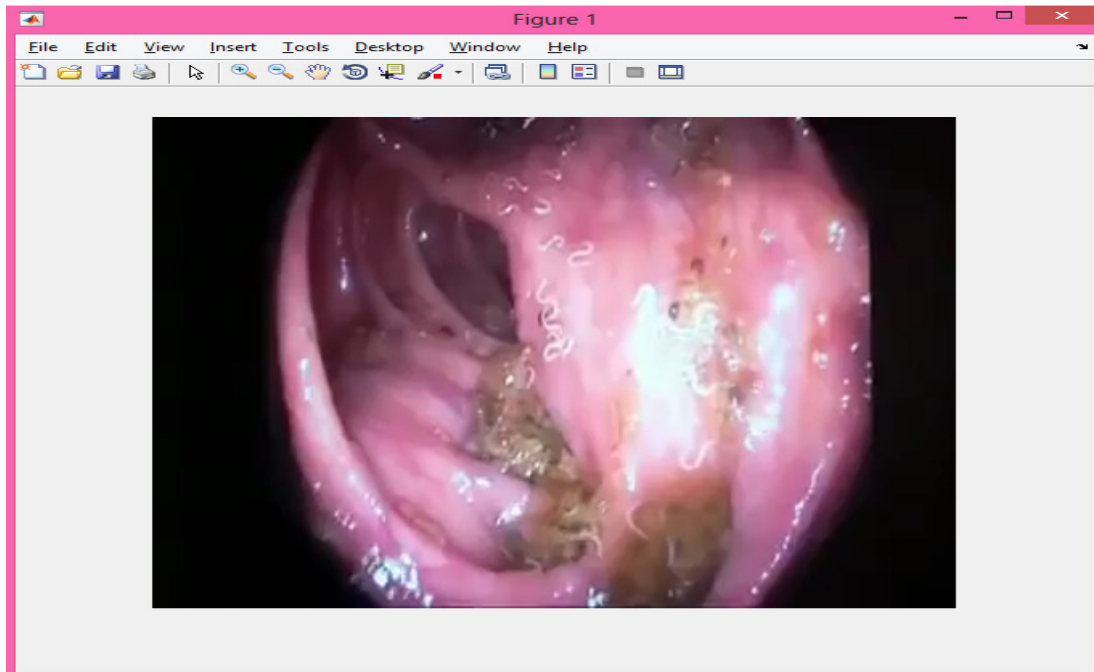
### **Region props**

Shape feature can be extracted by means of region props because it can be used for extracting the property of image region. Several region properties are there such as Area, Centroid, Convex length, Convex areas, Eccentricity etc.

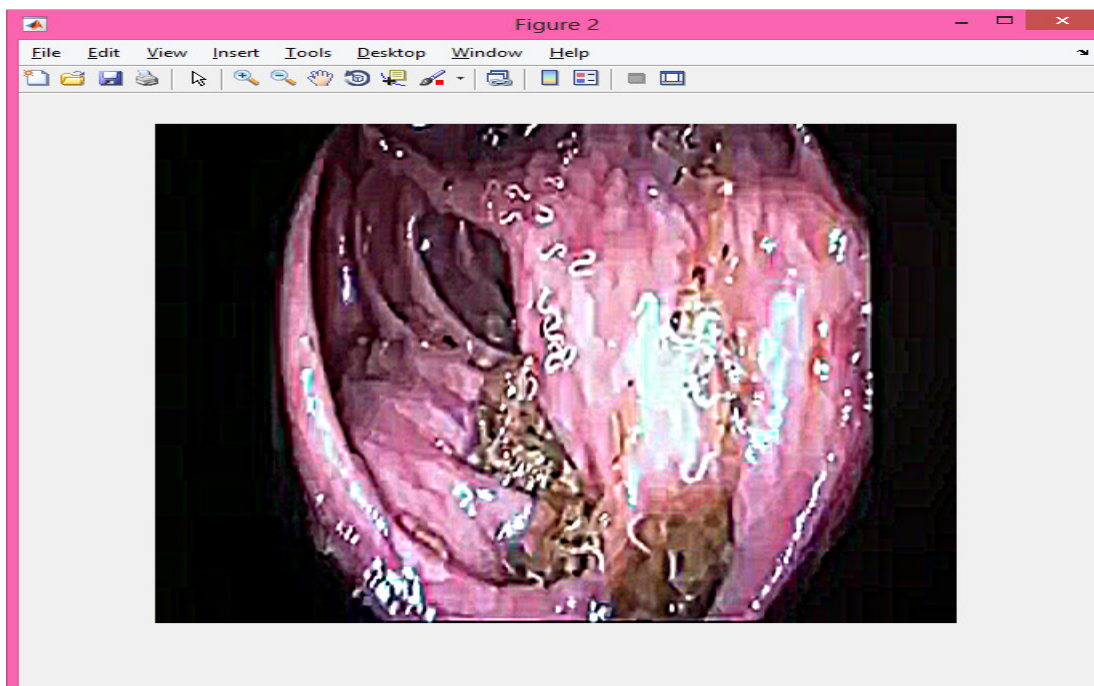
## **CLASSIFICATION**

The k-nearest neighbours algorithm is mainly used for classification and regression. In both cases, the input has k-closest training in feature space. In k-NN classification, the yield is a group bias. An item is classified through major vote of its neighbors, with the item individually assigned to the group. If  $k = 1$ , then the item is just assigned to the group of that sole nearest neighbor. In k-NN regression, the item containing property value shows the output. The outcome of the value contains the average of the values of its  $k$  nearest neighbors. After training the worms using WCE, the testing is done using WCE. On testing the data, we get output as the types of worms, worm count and its disease caused in human.

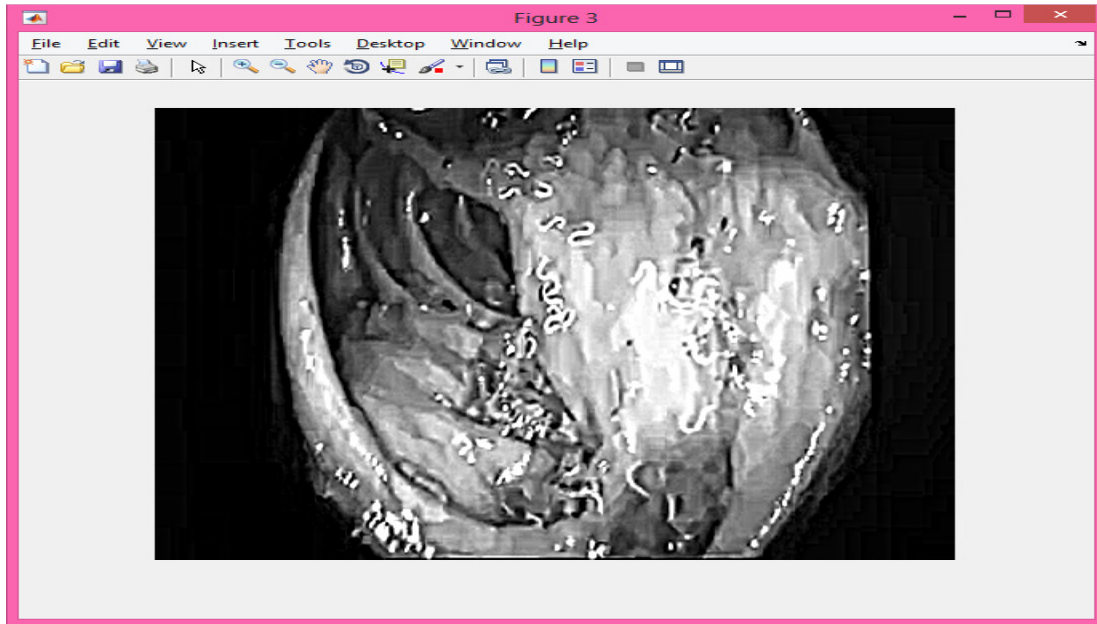
#### 4. EXPERIMENTAL RESULTS



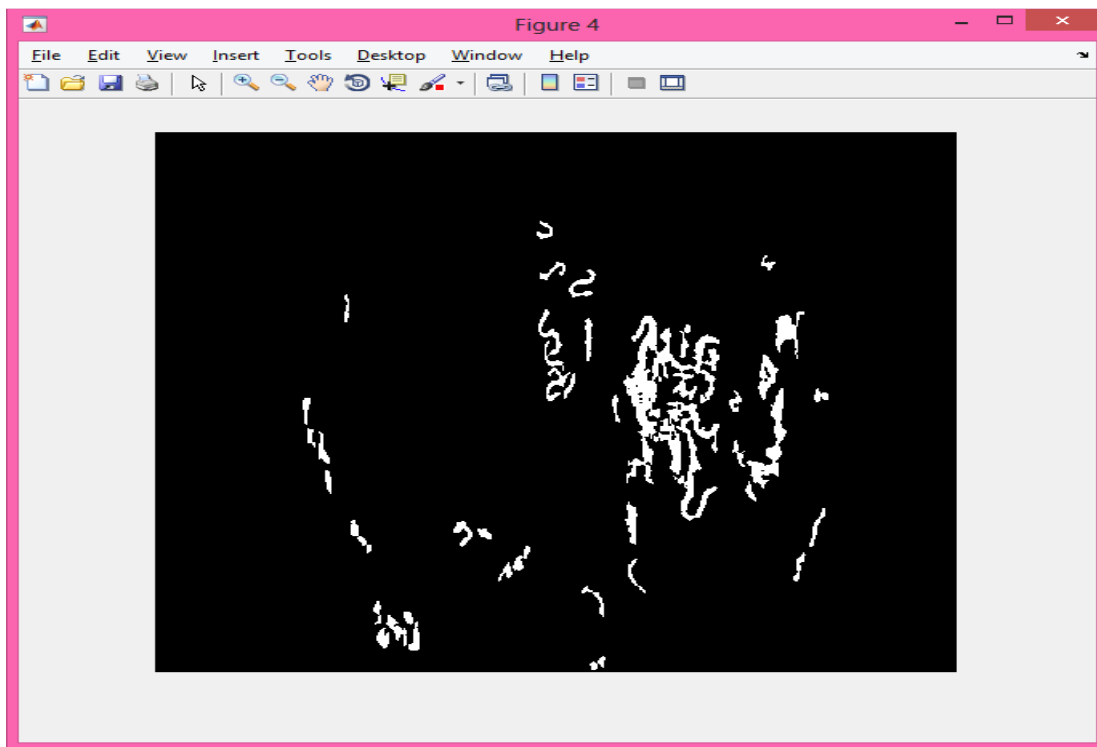
**Figure: 4.1** An input image representing the occurrence of various worms which is captured using WCE cameras.



**Figure: 4.2** Enhancement image obtained using Guided Filter.

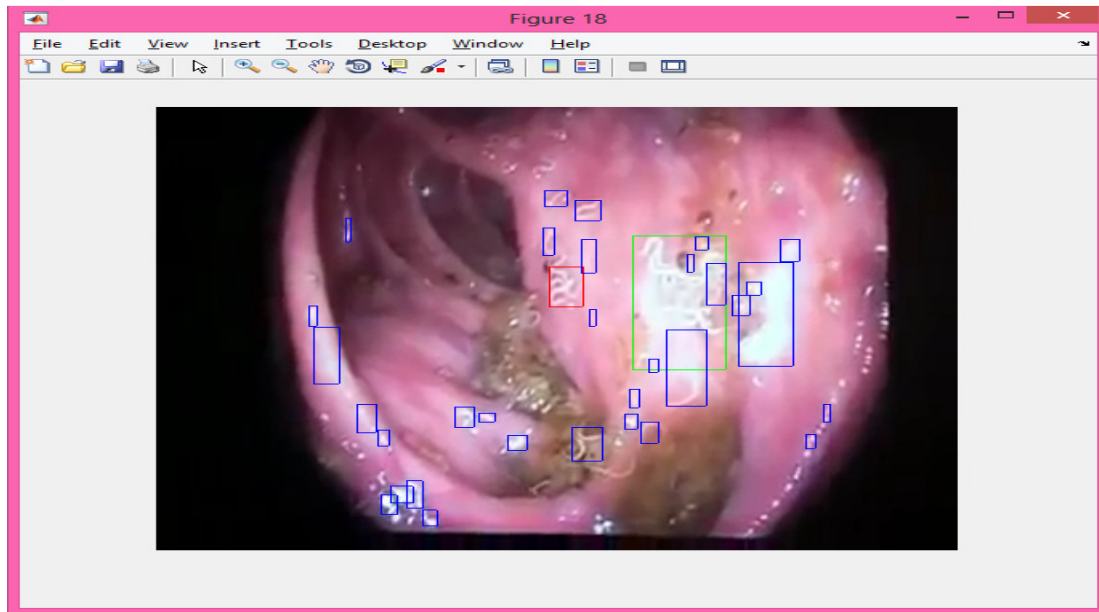


**Figure: 4.3 RGB to Gray Image**



**Figure: 4.4 Segmented image after using Multilevel Thresholding and Vector Quantization**





**Figure: 4.5 Classification using Hierarchical clustering**

## 5. CONCLUSION AND FUTURE WORK

This work has presented a framework for identifying hookworms and has proposed a packed set of Region Props for quantifying worms characteristics for hookworm detection. The worms classification accuracy was improved when concatenating a set of clustering approach and connected component algorithm. Routine recognition of hookworm for WCE images is a tough task. It aims to reduce the amount of images a clinician needs to review. This work may lead to more clinically helpful for identifying hookworms in human intestine within a short period of time. A bounding box is an uncomplicated and trendy communication hypothesis considered by many existing interactive image segmentation frameworks. By using this, Computational speed is increased. The crucial goal is that automatic detection system can be used in a real condition to assist endoscopists, and can even acquire more precise judgement than skilled endoscopists. In our future work, it will persist running on innovative clarification to further improve the performance.

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