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Colon Polyp Detection Using SFTA Algorithm

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Abstract—Colon cancers are the most common type of cancer formed in colon, a part of large intestine. The abnormal growth found in colon, polyp is major symptom in colon cancer. Colonoscopy is one of the efficient methods for detecting the colon cancer,here we use colonoscope for detection . Colon endoscopy is a technique in which the image of the intestine can be obtained through the camera attached to endoscope. Polyps are detected by analyzing the video sequences. A novel algorithm is proposed for the detection of polyps. In this method linear thresholding is being adapted for segmentation. Linear thresholding is used to detect the saturated region from the HSV image . Algorithm is based on extracting texture as well as color information which is being obtained from the frames. Color correlogram method and Bayesian classifiers are used to process the image. The proposed algorithm is very simple, fast and efficient method which is highly helpful for the radiologists in detecting polyps.

IndexTerms- ***Colonoscopy,Colonpolyp, HSVConvertion,Segmentation, Texture Analysis, Bayesian***

I.INTRODUCTION

Colon polyps are growths on the inner lining of the colon. Various types of colon polyps [1] with differing tendencies to become malignant. Abilities to predict the development of more polyps. Colon polyps are diagnosed by colon capsule endoscopy. Colon capsule endoscopy is a procedure that enables an examiner to evaluate the inside of the colon. Colon capsule endoscopy is commonly used. Colon capsule endoscopy (CCE) [2] is a feasible alternative method instead of computed tomography (CT).

Patient is asked to ingested the capsule. An on-board camera captures the digital images. 2 to 30 frames are captured in a second. Recorded video sequences is being analysed for the presence of polyps. Thousands of frames will be present in a single video sequence. Manual analysis of all these frames makes it difficult. Here we introduce an algorithm for detecting the presence of polyp. Thus reduces the number of frames to be evaluated by the doctor.

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II. LITERATURE SURVEY

Alexander V. Mamonov and Isabel N. Figueiredo developed a technique for detecting polyps, in which they could not explain about the density estimation of polyp. The algorithm they proposed is based on extracting certain geometric information from the frames captured by the conventional endoscope's camera. In this, they could not analyse the color information.

Here we propose an algorithm which helps in analyzing the depth and density of the polyp. In ths, we analyse the color information using color correlogram technique. This helps in finding out the various regions in which the polyp is spread. Inspite of conventional endoscopy, which is unclear, we have used here the most efficient means of endoscopy i.e, the capsule endoscopy. The image obtained via capsule endoscopy is of higher resolution and hence it is the most efficient technique than the earlier techniques.

III. PROPOSED ALGORITHM

In diagnosing and clinical treatment, endoscopy and capsule endoscopy are used. The software uses algorithm to find anatomical structures and region of interest. The algorithm takes each of the frames as input and the output can be classified as whether the frame contains polyp or the normal frame. For the analysis of the algorithm each of the single frames from the video sequence has to be analysed further for the detection of polyp. The method deals with basic image processing steps along with image segmentation by Linear Thresholding [3] to detect the polyp. Thresholding is the simplest method of image segmentation [4]. From a grayscale image, thresholding can be used to create binary image. The input images are used here for the detection of polyps are the endoscopic images.

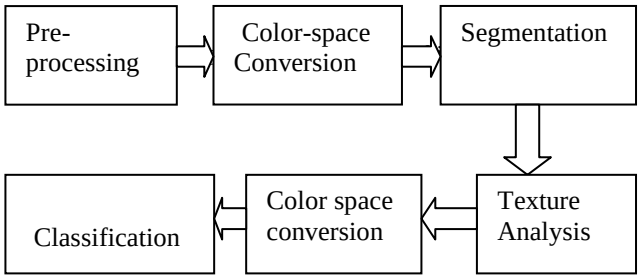

Fig.1 . Proposed concept for the exhaust heat recovery system.

A. PRE-PROCESSING

The aim of pre-processing is to improvement of the image data that suppresses unwanted distortions. The images obtained by the endoscopic video sequence. Steps done in pre-processing are filtering and edge detection [5]. Most of the shape information of an image is enclosed in edges. So first we detect these edges in an image and by using filter. Most efficient filtering method is Guassian filtering [6]. It is considered the ideal time domain filter.

Fig1- Input image

B. COLOR SPACE CONVERSION

Color space is an abstract mathematical model. It simply describes the range of colors as tuples of numbers, typically as 3 or 4 values. By using the color space conversion [7] the image intensity value can be obtained for the analysis of the image for the segmentation purpose.

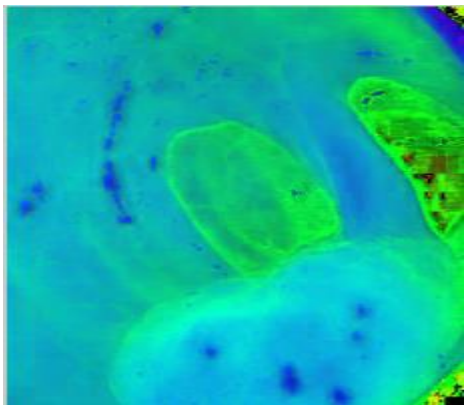

Fig 2- HSV Image

The frame is converted in to HSV color space.HSV is a cylindrical coordinate system, in which the points in RGB model is represented as cylindrical coordinates. Hue (H) is the attribute of a visual sensation. It is a measure of spectral composition of a color,when the angle varies. Saturation(S) is the refers to the purity of color of a stimulus relative to its brightness. Value (V) is the pixel intensity. The main reason to work on the HSV version of an image is because using Hue component makes the algorithms less sensitive to lighting variations. HSV separates image intensity values from the color information and is helpful for the histogram image equalization [8].

C. SEGMENTATION

Major steps in segmentation are Linear thresholding and Morphological operations. In this step, the main portion or the region of interest is been detected for further process and are done based on the thresholding. Thresholding is done to find out the actual area or the region of polyp. For this the thresholding parameter or the value is varied manually as a trial and error method.

Morphological image processing [9] is a non-linear operations related to the shape or morphological features. Morphological operations can also be applied to greyscale image, their light transfer functions are unknown.

Fig 3-Binary image after segmentation

Morphological techniques probe with a small shape or template called a structuring element.

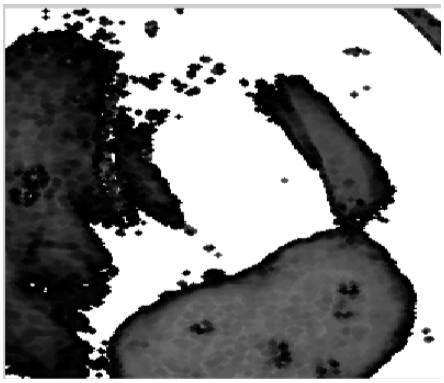

Fig 4 - Segmentation result

The structuring element is positioned at all possible locations in the image and it is compared with the corresponding neighbourhood pixel. The most basic morphological operations are dilation and erosion. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries.

D. TEXTURE ANALYSIS

SFTA algorithm is used in texture analysis. The polyps are highly texture, higher the texture content the more will be the presence of polyp region. The pre-processed frame contains both texture as well as cartoon components, to separate the pre-processed frame into the texture and cartoon components [10], this algorithm is used. The SFTA extracts feature by dividing the color of the image. Using thresholding technique, texture content is estimated.

Fig 5- Texture

E. COLOR CORRELOGRAM

Color correlogram expresses spatial correlation of color features when the changes in thedistance occurs. In correlogram , an image is a table indexed by color pairs, whered-the entry for row (i,j) specifies the probability of finding a pixel of color j at a distance d from a pixel of color i in the image.

F. CLASSIFICATION

Cancerous polyps can be estimated by using Bayesian technique. A Bayesian classifier [11] is based on the idea that the role of a (natural) class is to predict the values of features for members of that class. In this method various features are obtained by the grouping of different classes. Classes are being predicted by Bayes' rule . This method distinguishes different features as such human.

IV.RESULTS AND DISCUSSIONS

Automatic colon polyp detection is the most efficient method. This algorithm reduces the number of frames to be evaluated by the doctor and reduces the processing time.

At first the video sequence is converted into different frames. Obtained images are pre-processed by guassian filter. Then pre-processed frame is converted into HSV, converted frame for the analysis of the image for the segmentation purpose.

Segmented image is subjected to texture analysis. SFTA algorithm is used in texture analysis. From the texture analysis, find out the region which is highly textured.

Fig 6- Output image

After the texture is analysed ,using the color correlogram method, the polyp portion is detected. Then Cancerous polyps can be estimated by using Bayesian technique.

V.CONCLUSION

Colorectal polyps are now becoming a very common digestion disorder, which may either led to cancer. Due to the alarming rate of digestion problems medical professionals are finding modern techniques for the diagnosis and treatment of diseases. Thus we use capsule endoscopic techniques for diagnosis of polyps. Automatic colon polyp detection is being done by proposing a novel algorithm.

The novel algorithm of polyp detection based on extracting geometric information from the endoscopic video frames. Classification is obtained by utilizing texture information and geometrical information. The proposed algorithm is very simple, fast and efficient method which is highly helpful for the radiologists in detecting polyp

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