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DETECTION OF OESOPHAGUS TISSUE CHANGES USING IMAGE GLCM AND CURVLET TRANSFORM

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***Abstract*-Currently the assessment of tissues is principally not an automatic process. Physically analyzing a model is always non-effective and resource-wasting. This analysis takes a long time and is a very grueling process. Because of the human factors, due to fatigue and inattention, inexact diagnoses may take place, which have an outcome on the patient's life and health. Using staining and chemical fixation the analysis and evaluation of digitized tissues can be performed efficiently with computer aided detection. Computer-based cell analysis and the tissue-based analysis have importance with more care into the healthcare informatics, but these have great popularity with the generation or hardware components. The development began concerning a decade before, and since then it has turn into a major research region in medical informatics. Over the years various approaches were attempted by the developers, these are mostly based on the properties of the images, for example colors, shapes, contours and textures, and conclusions are drawn from these parameters.**

I. INTRODUCTION

The statistics of Hungarian Central Statistical Office, cancer is one of the main causes of deaths in Hungary. In the year of 2015, 32792 people died of some form of cancer, the rate is a little bit higher for males: 54%, for females it is 46%. According to World Health Organization's research, 603 people in Hungary were diagnosed with esophageal cancer, and 539 of them died in 2012, which is a very high rate. If the oesophagus adenocarcinoma is recognized in its early stage, it can be easily cured. However in later stages, it has a poor prognosis, thus making it harder to control. The Barrett Metaplasia's most conspicuous symptom is, that a goblet cell can only be found in the epidermis of the mucous membrane and glands. Our system is focused on the detection of goblet cells and cell nuclei. These objects has quite distinct parameters, therefore we examine them with different techniques. For the purpose of an effective detection, our algorithms handle numerous input parameters. To determine the proper set of parameters a developed genetic algorithm was utilized.

II. EXISTING SYSTEM

Oesophagus is one of the important part in human body, which transport oxygen and nutrition to body. However, beside this Oesophagus performs pH regulations, different immunological function, which helps fight infection and aid in the immune process. When this Oesophagus tissues are affect by any disease, its very hard to diagnosis in early because of its working model. There is no effective method or system to detection cancer tissues in Oesophagus. Endoscopy method was used to take images of tissues in inner wall of Oesophagus, which has a poor prognosis, thus making it harder to diagnosis. The main limitations of the existing system are the high human error rate and the inattention, inaccurate diagnoses happening.

III. PROPOSED SYSTEM

The purpose of the proposed prototype is to design and implement software, which can reduce the detection time of the prognostic factors of oesophageal cancer, helping the job of pathologists and specialists. The main focus of the software is the detection of Barrett's oesophagus, because it has a strong association with esophageal adenocarcinoma. The detection is based on digitals slides which come from virtual microscopes. The proposed system has a reduced processing time and improved accuracy in detecting goblet cell. The hardware requirements for the system are 120 GB hard disc space, 2 GB RAM, and the software requirements are IDE - MATLAB R2013a, C Language, and image processing tools. The block diagram of the system is shown below.

Block Diagram

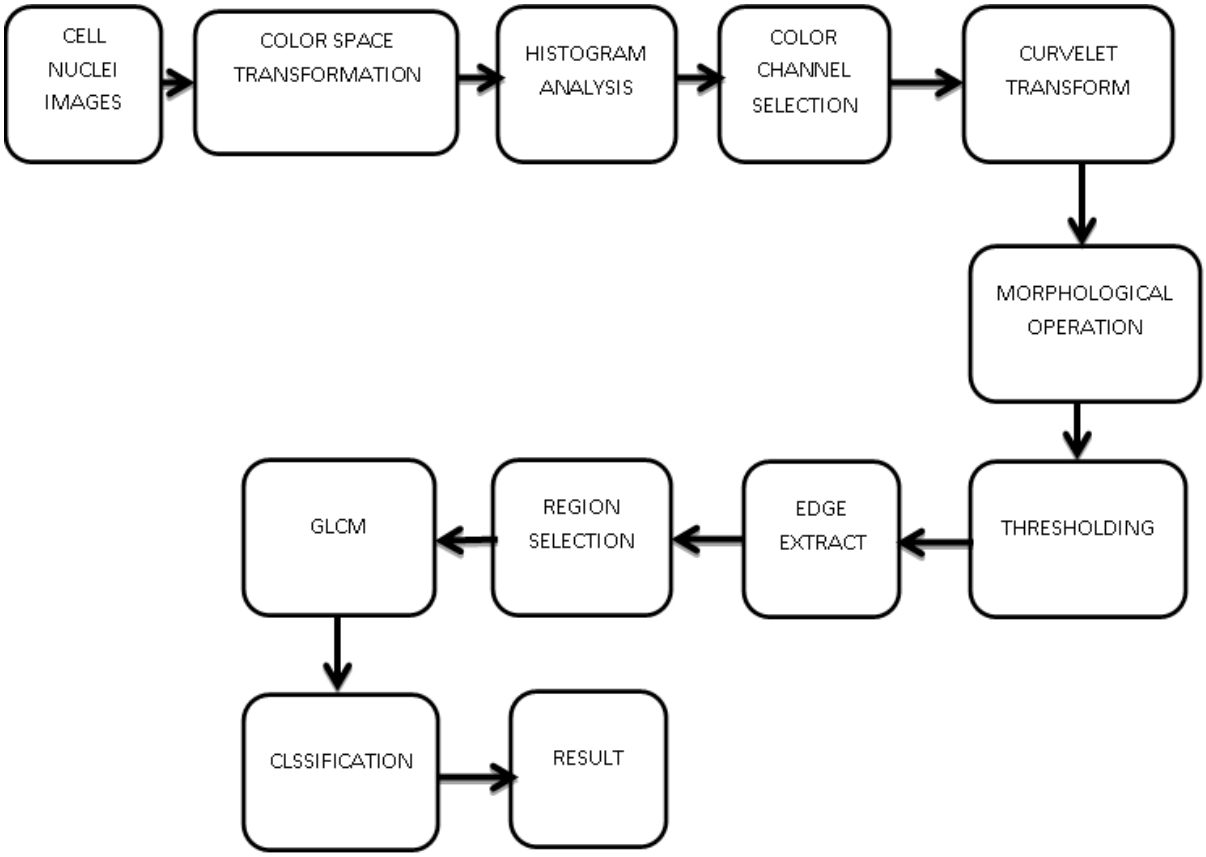


Figure 1 Block Diagram of the Proposed System

The algorithms used in the system are K-means Clustering algorithm-Classification, Curvelet Transform-Decomposition, and GLCM-Feature Extraction. GLCM is a matrix that describes the frequency of one gray level appearing in a specified spatial linear relationship with another gray level within the area of investigation. Therefore, the co-occurrence matrix is executed depended on two components that are the relative distance between the pixel pair d calculated in pixel number and its relative orientation φ.

Statistical approach of exploratory quality that defines the spatial association of pixels in the gray-level co-occurrence matrix (GLCM), which is also called as gray-level spatial dependence matrix. The GLCM parameters set separately the texture of an image by manipulative how time and again pairs of pixel with exact ideals and in a personage spatial relationship get place in an image, creating a GLCM, and then extracting statistical events from this medium.

The features are as follows,

i. Contrast feature: In this, t procedures that the local changes in the gray-level co-occurrence matrix.
ii. Correlation feature: The values on the joint probability occurrence of the particular pixel pairs.
iii. Energy feature: Provides the sum of squared elements in the GLCM. Also known as uniformity or the angular second moment.
iv. Homogeneity feature: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.

Cell Nuclei – Eukaryotes sometimes have one nucleus, however a number of cell varieties, like class red blood cells, haven't any nuclei, and a

number of others have several. Cell nuclei contain most of the cell's genetic material, organized as multiple long linear polymer molecules in advanced with an outsized form of proteins, like his tones, to make chromosomes.

Color area Transformation – Color area conversion is that the translation of the illustration of a color from one basis to a different. This generally happens within the context of changing a picture that's described in one color area to a different color area, the goal being to form the translated image look as similar as doable to the first.

Curvelet rework – Curvelets area unit a non-adaptive technique for multi-scale object illustration. Being AN extension of the riffle thought, they're changing into well-liked in similar fields, specifically in image process and scientific computing.

Morphological Operation – Mathematical morphology (MM) may be a theory and technique for the analysis and process of geometrical structures, supported pure mathematics, lattice theory, topology, and random functions. metric linear unit is most ordinarily applied to digital pictures, however it will be used still on graphs, surface meshes, solids, and plenty of alternative spacial structures.

Erosion - The erosion of a sq. of facet ten, focused at the origin, by a disc of radius two, additionally focused at the origin, may be a sq. of facet half-dozen focused at the origin.

Dilation – Dilation is that the twin operation of the erosion. Figures that area unit terribly gently drawn get thick once "dilated". simplest way to explain it's to imagine constant fax/text is written with a thicker pen.

Opening – gap basically removes the outer small "hairline" leaks and restores the text. The facet result is that it rounds off things. The sharp edges begin to disappear.

Closing - The closing of A by B is obtained by the dilation of A by B, followed by erosion of the ensuing structure by B.

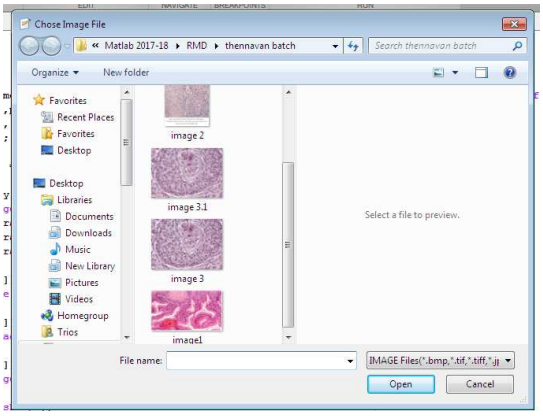
Thresholding - Thresholding is that the best technique of image segmentation. From a grayscale image, thresholding are going to be accustomed manufacture binary photos. The sole thresholding ways replace each part in an exceedingly image with a black part if the image intensity could be a smaller quantity than some mounted constant T (that is,), or a white part if the image intensity is larger than that constant. at intervals the instance image on the right, this ends up in the dark tree turning into completely black, and thus the white.

Edge extraction - Edge detection includes a spread of mathematical strategies that aim at characteristic points in a very digital image at that the image brightness changes sharply or, additional formally, has discontinuities. The points at that image brightness changes sharply area unit generally organized into a group of falcate line segments termed edges.

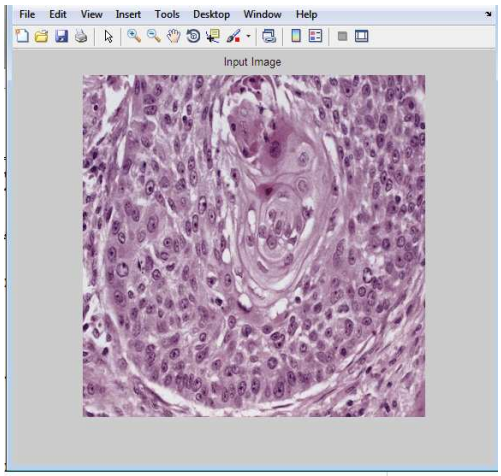
Edge cutting - Edge cutting may be a technique accustomed take away the unwanted spurious points on the perimeters in a picture. This method is utilized when the image has been filtered for noise (using median, mathematician filter etc.), the sting operator has been applied (like those represented above) to observe the perimeters and when the perimeters are ironed exploitation an applicable threshold price. This removes all the unwanted points and if applied rigorously, leads to one element thick edge parts.

IV. RESULT

The outputs of the various stages are shown in the following figures starting from input selection.



Input Image Selection



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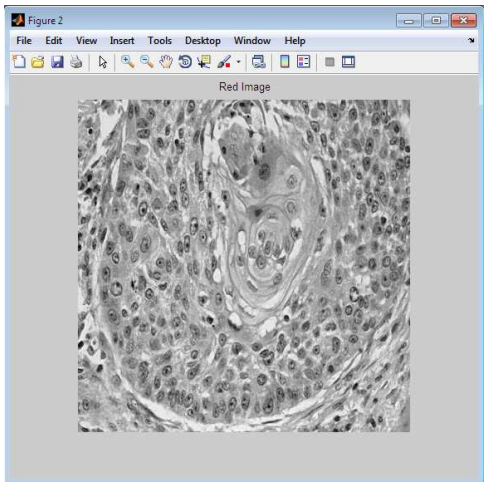
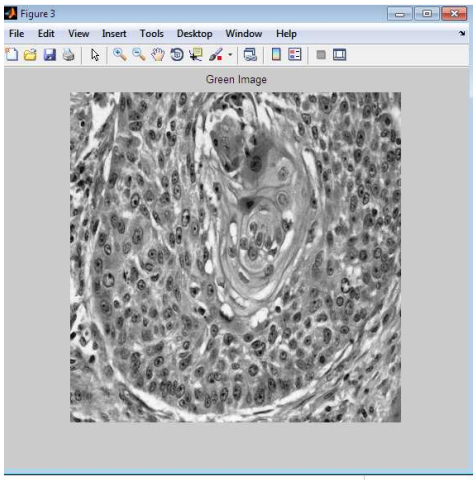
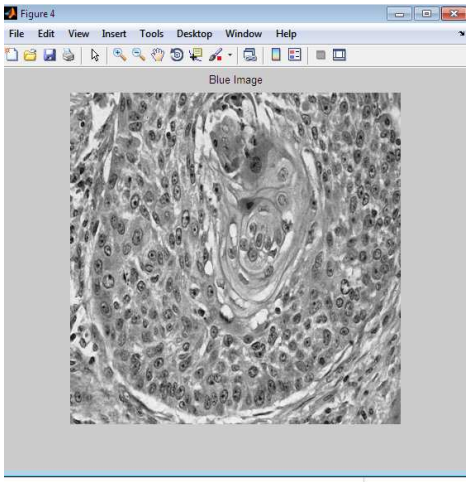


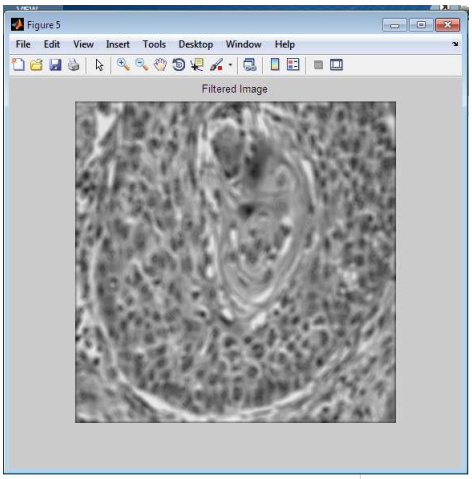
Input Image Red Scale



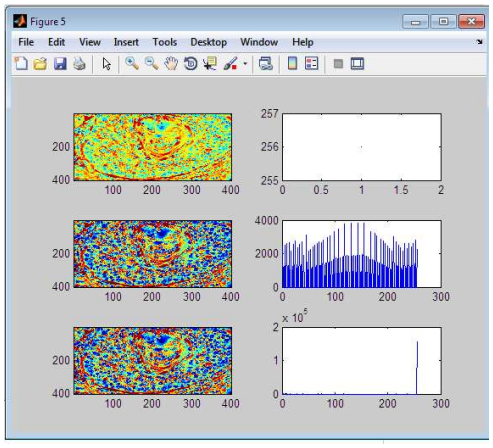
Input Image Green Scale



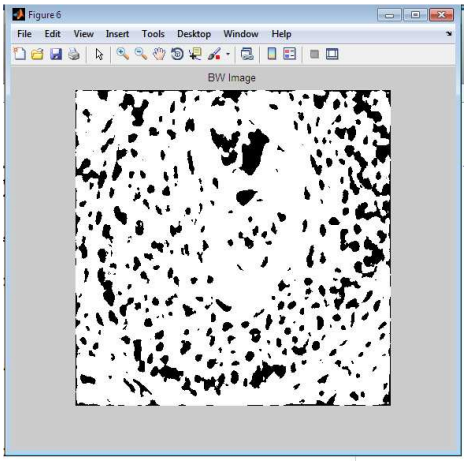
Input Image Blue Scale



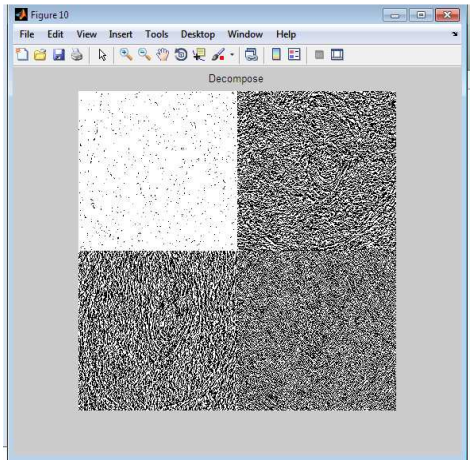
Input Image Filter Co-efficient



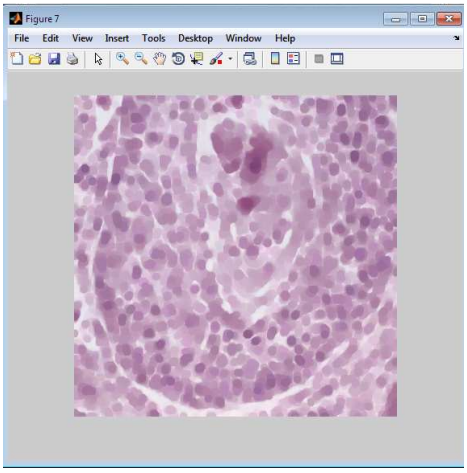
Histogram Equalization of Input Image

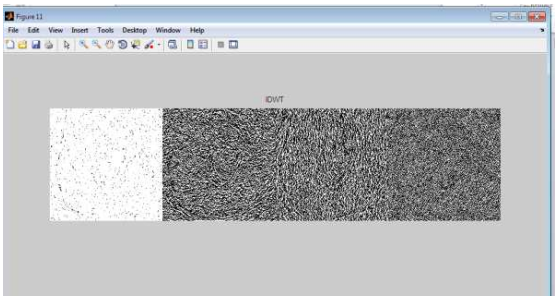


Binary Conversion

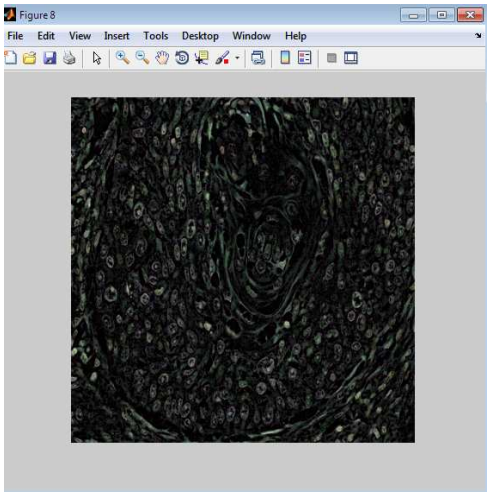


DWT

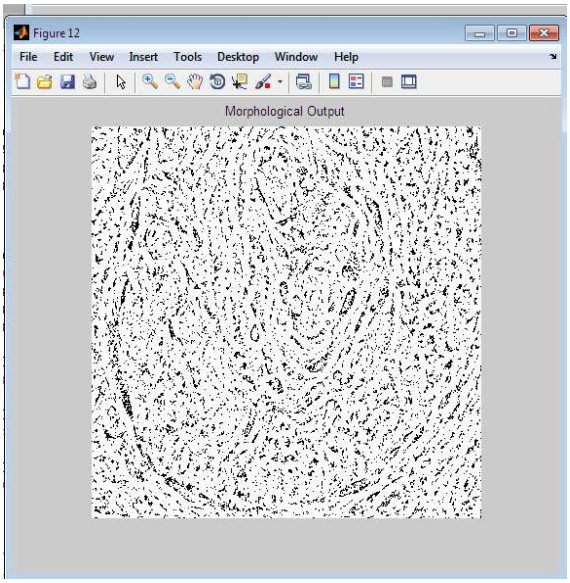




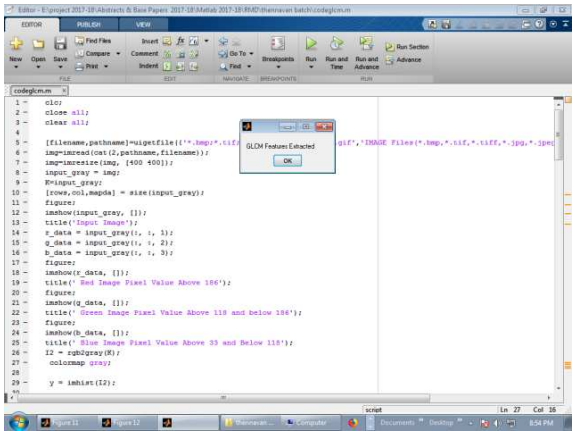
IDWT



Curvelet Transform



Morphological Operation Output



energy = 6.3633 e-01 to 6.2625 e-01

entrophy = 7.3104 e-01 to 7.3682 e-01

contust = 9.0656 e+00 to 9.8744 e+00

autoCorr = 5.1837 e+01 to 5.1435 e+01

V. CONCLUSION

The implemented prototype is able to analyze the oesophagus tissue images obtained by virtual microscope. For diagnosing the Barrett Metaplasia oesophagus disease, find the goblet cells and cell nuclei. After loading the image goblet cells are detected and produce an output image. There is an improvement in the goblet cell detection.

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