ISSN: 2321-7782 (Online)
Volume 2, Issue 12, December 2014
International Journal of Advance Research in Computer Science and Management Studies
Research Article / Survey Paper / Case Study
Available online at: www.ijarcsms.com

Polyp Analysis and Identification of Ulcerative Colitis Patient using Color Colon Images

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Abstract: ***In this paper we present a computer assisted diagnostic system for identification and analysis of polyps in an ulcerative colitis patient using color colon images obtained by colonoscopy. The proposed system would identify polyps and analyze the colon for any discrepancies. This is done by extracting the various features of polyps using various image processing algorithms. This paper gives a general idea of the usage of the proposed system for various medical purposes.***

Keywords: Image processing, colonoscopy, ulcerative colitis, feature extraction, computer assisted diagnosis, polyp

I. INTRODUCTION

Software engineering enables the construction of reliable services, which in the field of medicine can be regarded as crucial components of today's clinical practice.

Ulcerative colitis is a chronic inflammation of the large intestine (colon).The colon is the part of the digestive system where water is removed from undigested material, and the remaining waste material is stored. Ulcerative colitis can lead to polyp formation. Colon polyps are characterized by a small cluster of cells that form on the lining of the colon. Most polyps are not cancerous and are simply a result of abnormal cell growth, but some can gradually turn into colon cancer, so regular screening and removal of all polyps is important.

Extracting features from the colonoscopy images is essential for getting the features, which characterizes the properties of the colon. The features are employed in the computer-assisted diagnosis of colonoscopy images to assist the physician in detecting the colon status.

Methods for extracting new texture and color-based features from the colonoscopy images to classify the colon status are to be used.

II. LITERATURE SURVEY

Colonoscopy is the endoscopic examination of the inside of the colon (large intestine or large bowel). The colonoscope is a four foot long, flexible tube about the thickness of a finger with a CCD or a fiber optic camera and a source of light at its tip. The tip of the colonoscope is inserted into the anus and then is advanced slowly, under visual control, into the rectum and through the colon. It provides a visual diagnosis and grants the opportunity for analysis of suspected growth. Thus, colonoscopy is used to detect the presence of abnormalities in the colon. The analysis of the endoscopic images is usually performed visually and qualitatively.

Consequently, there are constraints such as time-consuming procedures, subjective diagnosis by the expert, interpretational variation, and non-suitability for comparative evaluation. A computer-assisted scheme will help considerably in the quantitative characterization of abnormalities and image analysis, thereby improving overall efficiency in managing the patient.

III. PROPOSED SYSTEM

Computer-assisted diagnosis in colonoscopy consists of colonoscopic image acquisition, image processing, parametric feature extraction, and classification. A number of schemes have been proposed to develop methods for computer-assisted diagnosis for the detection of polyps.

Extracting features from the colonoscopic images is essential for getting the features, which characterizes the properties of the colon. The features are employed in the computer-assisted diagnosis of colonoscopic images to assist the physician in detecting the colon status.

The Block Diagram given below explains the flow of proposed system. It involves the following stages

1. Preprocessing
2. Segmentation
3. Feature extraction
4. Classification and recognition

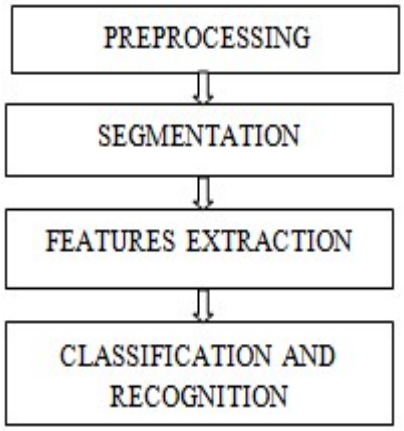


Fig 1: Block Diagram

Preprocessing

Image preprocessing can significantly increase the reliability of an optical inspection. Several filter operations which intensify or reduce certain image details enable an easier or faster evaluation.

Normalization is one of the steps in preprocessing. Normalization is a process that changes the range of pixel intensity values. Distribution of color values in an image depends on the illumination which may vary. Thus color normalization allows for object recognition technique based on color to compensate for the variation. The purpose of normalization in the system is to bring the image into a range that is more familiar or normal to the senses. This makes the comparison of images easy.

Segmentation

Segmentation partitions an image into distinct regions containing each pixel with similar attributes. To be meaningful and useful for image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest (i.e. Polyps).

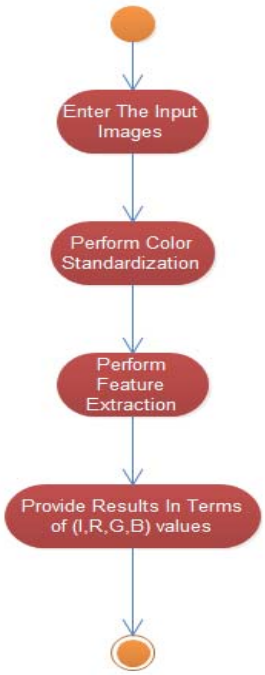
Feature Extraction

Feature extraction is form of dimensional reduction. In image processing it involves using algorithms to detect and isolate various desired portions or shapes of digitized image. Feature extraction allows properties or characteristics of an image to be represented in a quantifiable manner. The quantifiable measure will allow easy analysis of the provided colon images.

Classification and Recognition

The intent of the classification process is to categorize all pixels in a digital image into several classes. All classification algorithms assume that the image depicts one or more features and that each of these features belong to several distinct and exclusive classes. The proposed system will use various classification algorithms to classify between healthy tissue and unhealthy tissue. It will help in identifying the changes in various characteristics of polyps.

Flow of the Proposed System



IV. FUTURE WORK

There are lots of improvements that can be made on the current design and technology and lots of additional features can be added. The proposed system currently uses certain rudimentary algorithms for each step in the process. In the future modifications can be made to the system as a whole and to individual elements of the process. We could expect higher quality images in the future with advancements in colonoscopy equipments; the images could be of larger resolution and higher level of detail. Also variations in color values will be reduced. Thus prepossessing will become more efficient. Due to the higher level of detail segmentation will become less resource hungry. Development in the field image processing would allow us to replace currently used with more efficient algorithms. This will allows us to perform classification in a broader scope. Features like 3 dimensional image analysis can be added to the system to make the system more reliable. The system could provide better interaction between the system and the medical professional. The system could use various new algorithms to provide concrete and reliable results.

V. CONCLUSION

In the designing of our projects, we have kept in mind the user. The system provides a very straightforward and easy to use UI. The system used makes possible fast and precise results based on image analysis. The programming techniques used gives

very precise control over the provision of requirements of the users. The future implications of the project are very great. The system is very robust.

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