Chapter 11
Automatic Detection of Irritable Bowel Syndrome for 3D Images Using Supervoxel and Graph Cut Algorithm

Geetha Vaithianathan

https://orcid.org/0000-0003-0508-8075

Pondicherry Engineering College, India

Rajkumar E.

Pondicherry Engineering College, India

ABSTRACT

Medical image processing is a complex exercise and involves a number of stages to identify the disease in the arena of medical imaging. Irritable bowel syndrome is an acute disorder that causes intense abdominal pain and leads to changes in the bowel system. It gives rise to various indications like bleeding, bloating, celiac disease, gastric cancer, ulcer, etc. The system proposed here seeks to segment and classify each symptom of the irritable bowel syndrome individually with the aid of supervoxel segmentation algorithm. Features are extracted depending on the color, shape, and texture of the object. The extracted features are fed into the multi-support vector machine to identify the specific region in the medical image. The experiment provides the result of a test set 100 images stored in the data set which improves accuracy that refines the final output.

1. INTRODUCTION

Medical image processing contributes a lot to the process of diagnosis of diseases and also to the subsequent appropriate medical treatment. It facilitates the doctor's effort to see the interior portion of the body in order to pinpoint the cause of a disease. Medical image processing helps the physician to diagnose the cause precisely or identify the affected portion of the patient's anatomy. The primary purpose

of medical image processing is to observe the objects that are not seen by the naked eye, distinguish and then create a better image. Imaging methods like Magnetic Resonance Imaging (MRI), X-ray, Computed Tomography, Endoscopy Image, Ultrasound, etc. have led to the use of many image processing techniques today in the medical field.

Endoscopy, also known as Gastroscopy, is widely used now for diagnosing certain diseases in hospitals. It helps in identifying a health problem called the irritable bowel syndrome. When the camera has been inserted into the stomach via the esophagus, the doctor will then examine and possibly photograph or take biopsies of the patient's food-pipe, stomach and/or small intestine for any signs of the disease. The list of possible findings includes irritation of the stomach lining, gastric or duodenal ulcers, infection in the small bowel, inflammation and pre-cancerous conditions. Rarely can cancer also be diagnosed incidentally.

Irritable Bowel Syndrome is an acute intestinal disorder that effects changes in the bowel system. Identifying this disorder is not easy just because it does not cause any significant damage in the bowel pattern. In general, Irritable Bowel Syndrome causes cramping, constipation, bleeding, abdominal pain, bloating, gas, diarrhea, celiac disease, gastric cancer, ulcer, etc. The incidence of this disorder is more in South America and less in Southeast Asia. Both men and women before the age of 45 are mostly susceptible to this disorder. This study has taken up four major issues, namely bleeding, celiac disease, gastric cancer and ulcer with a view to identifying the disease using an improved imaging technique proposed and experimented in this project.

Gastrointestinal bleeding, GI bleeding in short, is also known as gastrointestinal hemorrhage. It refers to various forms of bleeding in the gastrointestinal tract from the mouth to the rectum. Some of the color-based features (Brzeski et al., 2013) that are used to detect bleeding are HSV histogram based on dominant colors, Local HSV histograms, RGB ratio color values, HSV color space and HSI color spaces. Celiac disease is a common disorder that affects genetically predisposed individuals on ingestion of gluten. Some of the features used to detect celiac disease are color-based, texture-based and spatial-based. Those features include shape curvature histogram, frame-to-frame pixel brightness, dominant period analysis and local binary pattern.

Figure 1. The Endoscopic images of bleeding, cancer, celiac disease and ulcer

12 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/automatic-detection-of-irritable-bowel-syndrome-for-3d-images-using-supervoxel-and-graph-cut-algorithm/315046

Related Content

Implementation of a Reversible Watermarking Technique for Medical Images
Ranit Karmakarand Abhishek Basu (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention (pp. 490-526).*
www.irma-international.org/chapter/implementation-of-a-reversible-watermarking-technique-for-medical-images/315061

Medical Image Analysis With Intelligent Techniques
Jayanthi Ganapathy, Purushothaman R., Sathishkumar M.and Vishal L. (2023). *Machine Learning and AI Techniques in Interactive Medical Image Analysis (pp. 51-69).*
www.irma-international.org/chapter/medical-image-analysis-with-intelligent-techniques/313471

Segmentation of Spine Tumour Using K-Means and Active Contour and Feature Extraction Using GLCM
Malathi M., Sujatha Kesavanand Praveen K. (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention (pp. 793-804).*
www.irma-international.org/chapter/segmentation-of-spine-tumour-using-k-means-and-active-contour-and-feature-extraction-using-glcm/315076

On the Implementation of a Fragile Medical Image Watermarking Technique Using Saliency and Phase Congruency
Abhishek Basuand Soumadeb Dutta (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention (pp. 207-242).*
www.irma-international.org/chapter/on-the-implementation-of-a-fragile-medical-image-watermarking-technique-using-saliency-and-phase-congruency/315048

Brain Tumor Detection Based on Multilevel 2D Histogram Image Segmentation Using DEWO Optimization Algorithm
Sumit Kumar, Garima Vig, Sapna Varshneyand Priti Bansal (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention (pp. 380-396).*
www.irma-international.org/chapter/brain-tumor-detection-based-on-multilevel-2d-histogram-image-segmentation-using-dewo-optimization-algorithm/315054