Unsupervised detecting and locating of gastrointestinal anomalies

Abhishek K L1, Parinitha B S2, Pavithra G S3 , Ranjitha G4 , Rashmi K S5

1Assistant Professor, Department of Computer Science and Engineering, Sapthagiri College of Engineering, 2 ,3,4,5UG Student, Department of Computer Science and Engineering, Sapthagiri College of Engineering, Bangalore,Karnataka

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Abstract - *The detection and diagnosis of a gastrointestinal disease is a major concern. This system detects locations of GI anomalies within the video frames, and abnormal frame detection is based on automatically derived image features. Various supervised and semi supervised techniques have been proposed over the years which are shown to be more accurate when compared to other diagnosing and detecting systems. In this paper, an overview of various unsupervised machine learning techniques is presented.*

Key Words: **Gastrointestinal anomalies, Unsupervised Machine Learning, Image Processing.**

1.INTRODUCTION

Gastrointestinal diseases are the diseases which affects the gastrointestinal tract. The organs which can be affected are, Oesophagus, Stomach, Small intestine, Large intestine, Rectum, Liver, Gallbladder Pancreas and Other organs of digestion. The gastric cancer and esophageal cancer are the most common cancers. It is very necessary to detect these types of cancers related to gastrointestinal tract. Lesion is a region of organ or tissue suffered due to damage occurred through a disease or injury. [2]

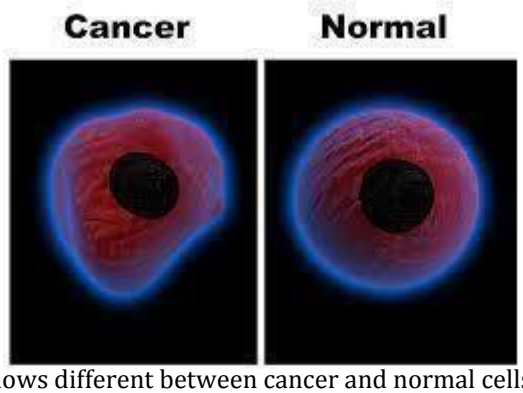


Fig: shows different between cancer and normal cells.

It can be found in any part of the gastrointestinal tract. This causes huge loss of blood. Ulcers in stomach are the main cause for gastrointestinal bleeding. In order to achieve accurate results, the most widely used image-based diagnosis such as ultrasonography, MRI, CT techniques. These methods are frequently incorrect. Hence, accurate assessment of abnormalities remains a challenge and an abnormality go unnoticed most of the times.

Human vision is not accurate as that of computer vision. One of the simple and easy methods is to train the computer system, to do the work without human intervention. This is achieved by employing machine learning techniques along with the image processing techniques. This is highly useful in detection, diagnosis of any medical abnormalities. Earlier methodologies employed the use of weakly supervised and semi supervised machine learning techniques. This requires human effort to train the computer system. This is highly impossible task, since there are trillions and trillions of medical abnormalities found among people all over the world.

Hence, the detection of gastrointestinal anomalies is of great concern. Therefore, the detection of these diseases is very important. The techniques used for detection of gastrointestinal diseases are

1. Supervised learning
2. Semi supervised learning
3. Unsupervised learning.

Supervised learning:

In this technique used, a set of annotated images that can be further classified as semantic labels has been used as training set. It uses weakly supervised convolutional neural network algorithm. [1]

Semi supervised learning

In this technique, a set of annotated images that can be further classified as semantic labels or bounding boxes has been used as training set. It uses EM algorithm [4] [15]

Unsupervised learning

To overcome this, unsupervised machine learning techniques are used to provide a more accurate detection. In the unsupervised machine learning techniques, the images are analyzed and all the abnormalities are detected.This methodology is based on unsupervised machine learning technique, is implemented in three mapping phases:

1.Color mapping

2.Orientation mapping

3.Intensity mapping

1.1 Overview of detection and localization of Gastrointestinal Anomalies: Weakly and semi supervised machine learning techniques have been most commonly used in image based medical diagnosis when compared to other applied fields of image processing and analysis. [1][2]

The detection of a gastrointestinal lesions, a gastrointestinal anomaly is as follows:

Lesions are detected from Endoscopy Images based on

1.Convolutional Neural Network (CNN)

2.Support Vector Machine (SVM)

3.Local Color vector patterns (LCVP)

4.Color Wavelet Covariance (CWC) features.

The lower complexities in implementation, computation, processing requirements and so forth have led to the use of High-Quality Image Compression. For image which is used transform the colors. compression, we use DEWC coding method. The spatial frequency distribution of red component is lower than relatively high while compared to blue and red components. DEWC coding saves more bits on red band while allocating more bits on green and blue bands. Thus, helps in improving the image quality**.** [3]

However, several doctors discovered compressed images are insufficient for detection of gastrointestinal anomalies. In order to analyze in video frames, we when moving along gastrointestinal tract, which is analyzed as as an image or a video sequence in a computer system. Again, we must analyze the infected part through human Vision. Moreover, the WCE becomes inefficient since it cannot be in the gastrointestinal tract for long duration of time, the Swallow able sensing device came to use, for long-term gastrointestinal tract monitoring. A swallow able sensor device that can be ingested orally, later arriving to the stomach, where the device can indwell for a long term and can be egested at any time after it is triggered using wireless communication. However, swallow able sensor becomes inefficient, since we do not make a comparative analysis of a healthy and unhealthy individual.

Phonograms are used to detect different functioning modes of the normal gastrointestinal tract, both in terms of localization and of time evolution during the digestion. From a database of 14 healthy volunteers, recorded during 3 hours after a standardized meal. Data analysis is performed using a multifactorial statistical method. Endoscopic ultrasonography

(EUS), yields cost-effective and gives better results. Abdominal ultrasonography helps in the diagnosis of duplication cysts. [7][8]

2.METHODOLOGY

1.Image Conversion

Images are resized to smaller size in order to apply the following algorithms.

2.Grayscale Conversion

Converting the images of RGB format to grayscale format. This helps in doing further image processing.

3.Thresholding

To distinguish between normal and abnormal region, we are setting threshold values.

4.Histogram

Histograms are graphical representation of data by which we can predict whether the region is abnormal or not.

5.Conversion to HSV format

Images of RGB format is converted to HSV format in order to separate the color components. These components are Hue, Saturation and Value.

6.Conversion to YCbCr format

Images of RGB format is converted to HSV format in order to separate the color components.

7.Applying erosion to image

Erosion operation removes the boundaries of an image and intersection of two images. This helps in clear visualization of the images and thus helping in separation of color components.

8.Splitting the eroded image into different channels

Eroded images are splitted into channels in order to determine the intensity of the affected region.

9. Length and Depth of abnormal region.

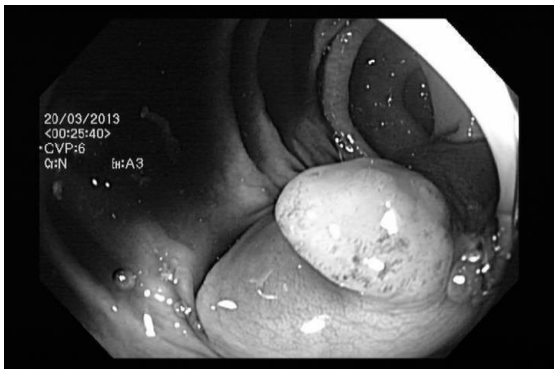
The main aim of this project is to find the dimensions of infected region.

10.Applying bounding box to infected regions in the image.

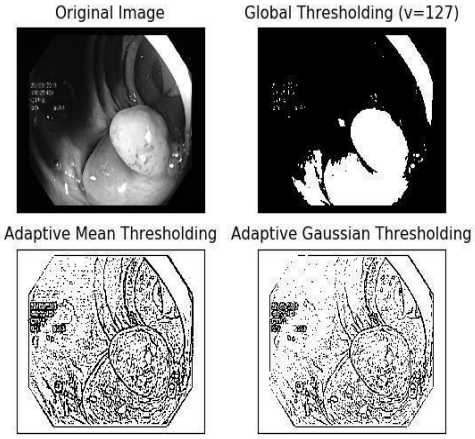
Bounding box is a rectangular box which is used to highlight the infected regions of abnormal region

3.RESULTS

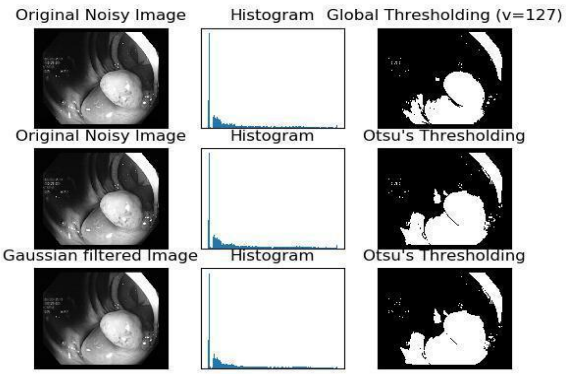
1.Grayscale conversion



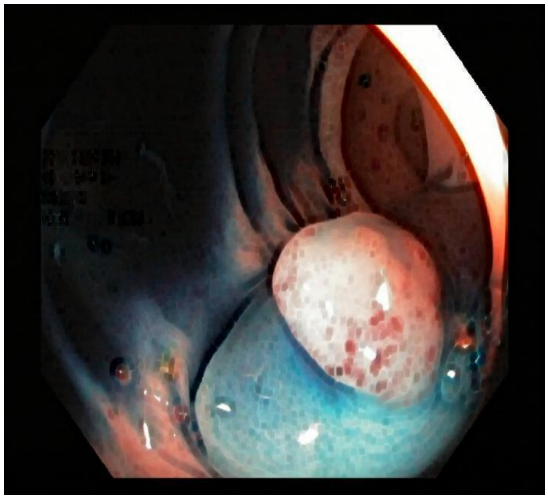
2.Thresholding



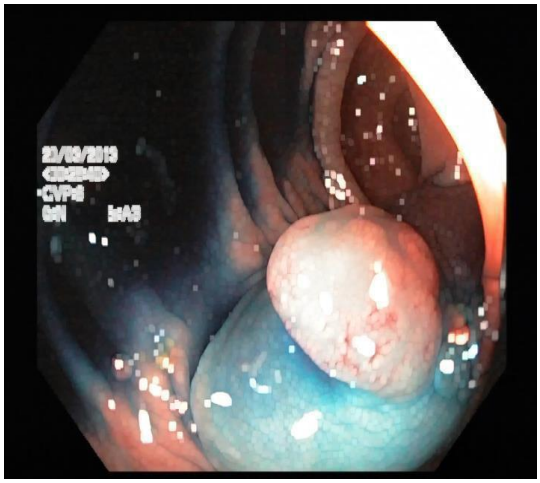
3.Histogram and Otsu's Thresholding



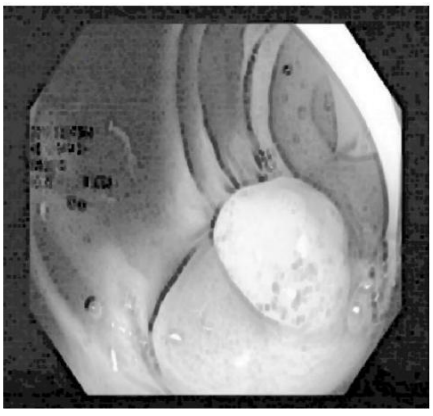
4) Erosion and of a image



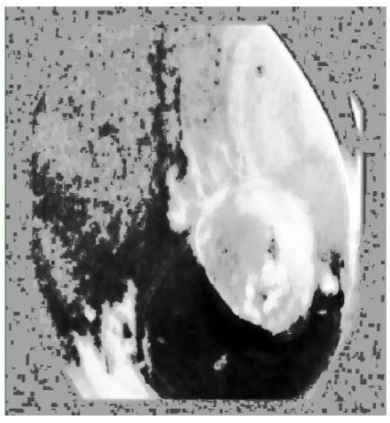
5) Dilation of a image



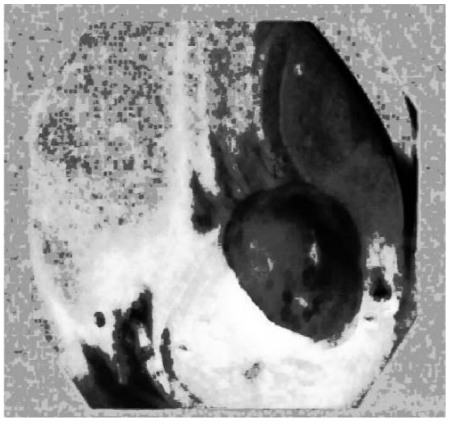
6) Splitting the eroded image into different channels



Channel 1

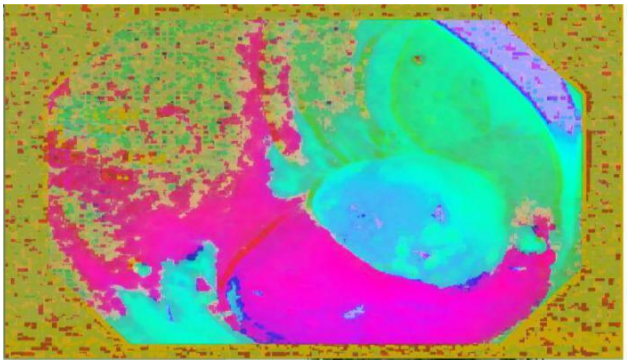


Channel 2

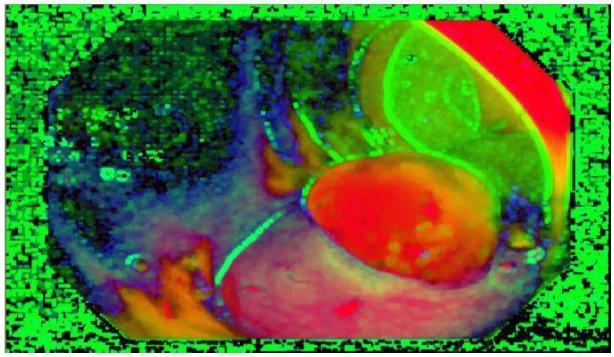


Channel 3

7) HSV image and YCbCr image

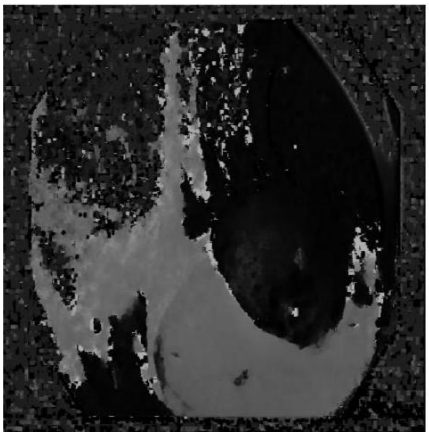


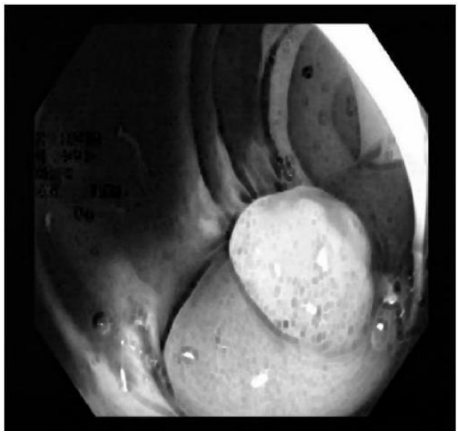
YCbCr image

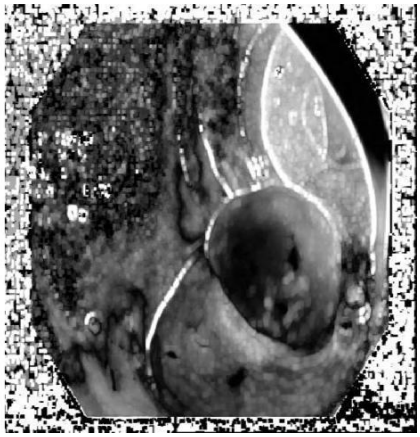


HSV image

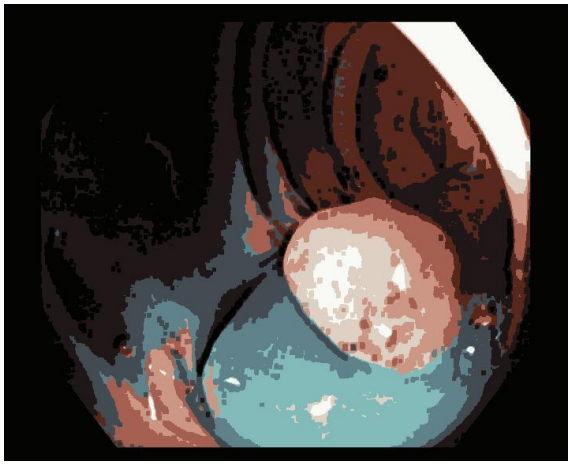
8) Hue ,Value and saturation



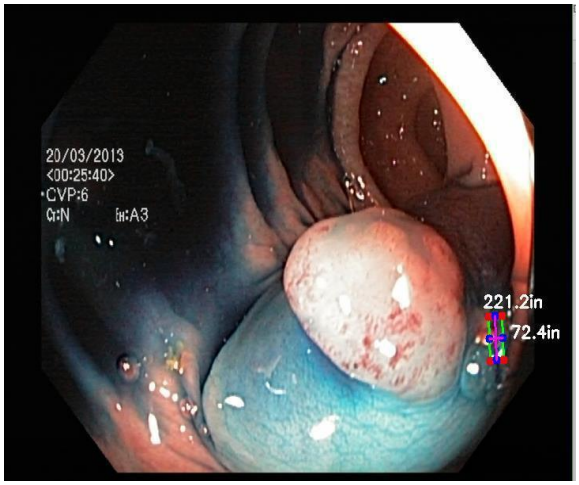




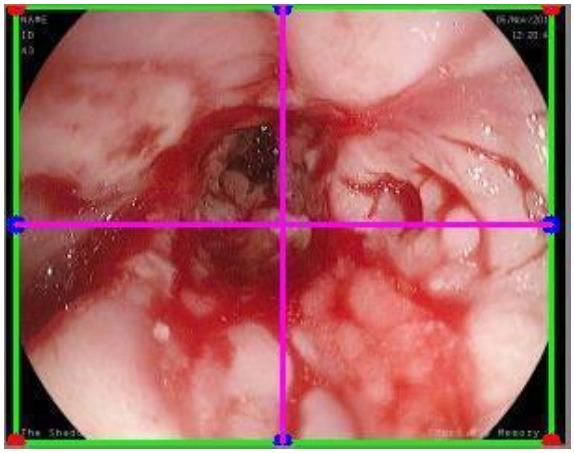
9) Result of splitting HSV to hue, value and saturation



10) Finding dimensions of abnormal region



11) Bounding Box of infected region



4. CONCLUSIONS

In this paper, the technique of detection and localization of gastrointestinal anomalies is put forth. An attempt has been made to contemplate the significance of various medical diagnosis systems that have been proposed over the years to overcome the challenges in detection and diagnosis of gastrointestinal anomalies. The methods employed to overcome the disadvantages of supervised machine learning are presented. The system's advantages and disadvantages are presented for each paper that has been surveyed. The need for unsupervised machine learning systems is emphasized. The overview of the project is to highlight the features that are essential for an integrated understanding of gastrointestinal disorders. It has many advantageous applications in real world and so used in many projects. Furthermore, this overview will help various analysts and researchers who are keen on creating unsupervised machine learning systems.

REFERENCES

[1]Iakovidis, Michael Vasilakakis, Vassilis Plagianakos," Weakly-Supervised Convolutional Learning for Detection of Inflammatory Gastrointestinal Lesions" in Anastasios Koulaouzidis Endoscopy Unit the Royal Infirmary of Edinburgh, UK IEEE Endoscopy Video" 2008

[2]Sindhu C P PG Scholar, Department of ECE, Jawaharlal College of Engineering & Technology, Palakkad "Automatic Detection of Colonic Polyps and Tumor in Wireless Capsule Endoscopy Images Using Hybrid Patch Extraction and Supervised Classification".2017 IEEE

[3]Jee-Young Sun1, Sang-Won Lee1, MunCheon Kang1, Seung-Wook Kim1, SeungYoung Kim2, Sung-Jea Ko1 1Electrical Engineering, Korea University, Seoul, Korea "A Novel Gastric Ulcer Differentiation System Using Convolutional Neural Networks".

[4]Erzhong Hu Hirokazu Nosato, Hidenori Sakanashi, Masahiro Murakawa "Anomaly Detection for Capsule Endoscopy Images Using Higher-order Local Auto Correlation Features". 2012 IEEE

[5]KonstantinPogorelov,Simula Research Laboratory, Norway University of Oslo, Norway Sigrun Losada Eskeland, Baerum Hospital, Norway" A Holistic Multimedia System for Gastrointestinal Tract Disease Detection".

[6]Farah Deeba, Shahed K. Mohammed, Francis M. Bui, Khan A. Wahid (Authors) 2University of Saskatchewan, Saskatchewan, Canada,"Automatic Bleeding Detection in Wireless Capsule Endoscopy Based on RGB Pixel Intensity Ratio ieee 2014.

[7]Dimitris K. Iakovidis*, Senior Member IEEE, Spiros V. Georgakopoulos, Michael Vasilakakis, AnastasiosKoulaouzidis, and Vassilis P. Plagianakos, Member IEEE," Detecting and Locating Gastrointestinal AnomaliesUsing Deep Learning and Iterative Cluster Unification.IEEE 2018

BIOGRAPHIES

Mr.Abhishek K L
Asst.Professor,Dept.of CS&E
Sapthagiri College of Engineering
Bangalore
(GUIDE)

Parinitha B S
Sapthagiri College of Engineering
UG Student

Pavithra G S
Sapthagiri Collage of Engineering
UG Student

Ranjitha G
Sapthagiri College of Engineering
UG Student

ollege of Engineering