Journal of Positive School Psychology
2022, Vol. 6, No. 4, 203-206 http://journalppw.com

Diagnosis of gastric cancer using mask R – CNN and GrabCut segmentation method.

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ABSTRACT:

In today's world almost 5.6% of people were affected by the gastric cancer. The right measure at right time has to be taken to prevent the people from severe problem. In this paper we proposed an idea to detect the cancer at early stage most accurately.At present,doctors detect the gastric cancer by endoscopic image of patient manually, whereas in our project the system will automatically detect the disease. Bringing automation in disease detection will increase accuracy and efficiency. For this automation, endoscopy images of stomach where taken and trained up ourneural network. Mask R-CNN is used to segment the lesion place in the image frame whereas the use of Grabcut is for further refinement of segmented lesion formed by Mask R-CNN.

Keyword: Mask R - CNN,GrabCut, CLAHE, Image processing, gastric cancer detection.

I INTRODUCTION:

In human life, cancer is considered to be a most dangerous disease, in fact its act as second leading disease which cause of death in human life. But, nowadays improvement in technology made cancer detection and prevention process in efficient manner. Cancer in body occurs when there is a growth of abnormal cell which affect the normal body tissue. Gastric cancer which is also known as stomach cancer formed when the abnormal cells formed in the stomach.If this disease is not diagnosed in a timely manner, it may pose a serious threat to human life.

Image processing is a technique is used to extract some useful information from the image. The image processing technology can detect the majority of malignancies. Importing image processing technique in gastric cancerdetection will be very helpful and effective in identification process.Here,we collected the endoscopic video from the hospitals and then loadedthe video into our software. Our software will split the video into frames and then pre-process the each frame to enhance it's quality. Then by using mask R–CNN and Grabcut segmentation process we segment the Gastric lesion place in the frame.

II. LITERATURE SURVEY

Convolutional neural networks were utilised by Sakai Y et al. [17] to identify gastric cancer in the human body.They trained the convolutional neural network with 926 endoscopic pictures, and it detects illness with an accuracy of 82.8 percent.Kenta Ishihara et al. [8] used patch based convolution neural network to detect the gastric cancer. The input they have taken is X-ray images of stomach and the main problem in this paper is the x-ray image they used is taken from the single angle of the stomach.

Toshiaki Hirasawa et al. [3] applied convolutional neural network to indentify the gastric cancer. In this they trained the neural network by using 13,584 endoscopic images and this system detect 70 of 71lesion correctly and thus success rate of their system is 98.6%. Mitsuaki Ishioka et al. [5] developed a method to detect the gastric cancer using Convolutional neural network .For this, the input taken is video image and this system provide success rate of 92.2% when the lesion is of size below 6. When the lesion size is 6 and above the success rate is 98.6%.Xu Zhang et al. [16] uses convolutional neural network

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with concise model to classify the Gastric precancerous diseases which will turn into the cancer if misdiagnosed. The accuracy of this GPDNet is 80.90% which is less accurate rate than other detection process.

III METHODOLOGY:

A. COLLECTION OF DATASET:

In dataset collection, we collected two kinds of dataset namely Training dataset and testing dataset images.Fortraining dataset hundreds of images from two hospitals and trained our CNN. For testing dataset we collected the endoscopy video from hospitals and then tested our CNN.

B.PRE-PROCESSING OF DATASET

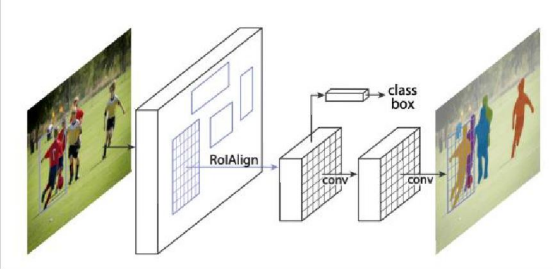
In initial stage twoprocesses has been carried out namely video into image conversion andEnhancement.In our project, test input we took is endoscopic video. So, weconvert the video into images frames by using Matlab software.The image we acquired from the software may not be clear. So we enhance the image quality by using CLAHE algorithm. CLAHE algorithm work by partioninga image into tiles and redistribute lightness value across each partition.

C.SEGMENTATION

This is the main stage in gastric cancer diagnosis process. Two kinds of segmentation is done in this step, mask R-CNN followed by GrabCut segmentation process.

(i)Mask R-CNN:

Mask R-CNN is upgraded version of faster R- CNN.For object detection tasks, the faster R-CNN employs ConvNet, Region proposal network (RPN), and Region of interest (ROI) modules. For given input image, it identifies the bounding box coordinate and returns class labels for object. Mask R –CNN is considered to be an advanced version of Faster R – CNN in object detection process. It consists of ResNet 101 architecture, Region proposal network (RPN) and Region of interest (ROI) for object detection process.



Our preprocessed images are given to the ResNet 101 architecture. In this feature of the image is extracted. The extracted feature is fed into the Region of Interest phase as an input. In this boundary box is generated around the object. This boundary box is passed to the Region of Interest phase. The input which ROI received is of different shape. So this pooling will convert those regions into same size. Along with this Mask R-CNN will also produce the segmented mask for the object in the boundary box region.For this process we have to calculate the region of interest by using Intersection of Union value with ground truth boxes.

IoU = Area of intersection/Area of Union

If the IoU value is 0.5 or above consider it as region of interest or omit the region. In this phase we obtained lesion object in the image.

(ii)GrabCut:

The bounded region obtained from the Mask R – CNN is given as input to the GrabCut for further refinement. This phase uses the Gaussian mixture model for estimating the colour distribution values of an object and the background of the image. Based on these values it constructs the Markov random field on pixels.Energy Function prefer the connected region to have same label and it runs the graph cut optimization methods to infer their values. The achieved result is more precise than the Mask R-CNN result.Thus it acts as refinement process in Mask R – CNN

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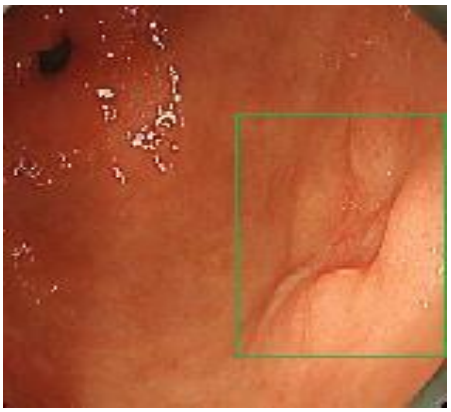

a) Mask R-CNN Segmented image

b) After GrabCut segmentation

Conclusion:

In this process we Combined and work with two segmentation process namely Mask R-CNN and GrabCut segmentation and diagnosed the gastric cancer lesion as much as appropriately. The percentage of accuracy we got in our project is 98%.In future work we try to produce cent percent diagnosis rate in gastric cancer detection process.

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