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A Study about Color Normalization Methods for Histopathology Images

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Highlights

- A detailed study about different color normalization methods for histopathology images.
- Quantitative and Qualitative results evaluation of color normalization methods on histopathology images.
- Performance comparison of different color normalization methods.

Abstract— Histopathology images are used for the diagnosis of the cancerous disease by the examination of tissue with the help of Whole Slide Imaging (WSI) scanner. A decision support system works well by the analysis of the histopathology images but a lot of problems arise in its decision. Color variation in the histopathology images is occurring due to use of the different scanner, use of various equipments, different stain coloring and reactivity from a different manufacturer. In this paper, detailed study and performance evaluation of color normalization methods on histopathology image datasets are presented. Color normalization of the source image by transferring the mean color of the target image in the source image and also to separate stain present in the source image. Stain separation and color normalization of the histopathology images can be helped for both pathology and computerized decision support system. Quality performances of different color normalization methods are evaluated and compared in terms of quaternion structure similarity index matrix (QSSIM), structure similarity index matrix (SSIM) and Pearson correlation coefficient (PCC) on various histopathology image datasets. Our experimental analysis suggests that structure-preserving color normalization (SPCN) provides better qualitatively and qualitatively results in comparison to the all the presented methods for breast and colorectal cancer histopathology image datasets.

Index Terms—Histopathology images; Color variation; Spectral normalization; Quality metrics.

1. INTRODUCTION

Histopathology refers to the pictorial examination of tissue to study the cancerous disease under the microscope and Histology is the visualization of plant and animal tissue under the microscope. Histopathology is defined as the study of change/variation in the tissue caused by the disease. Digital histopathology (Gurcan et al., 2009) is a new field for research where color normalization methods, segmentation methods, feature extraction of histopathology images and classification methods are exploited and make the computer to understand histopathology images for the diagnosis purpose. Histopathology is used in clinical medicine where it involves the examination of tissue removed from the patient for a detailed study. In histology, histologist prepares slide and find out the cell or tissue caused by disease or not. If the cells or tissues are affected by the disease, then the diagnosis of histology is said to be

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