



Colour model analysis for microscopic image processing

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Abstract

Aims: This article presents a comparative study between different colour models (RGB, HSI and CIEL*a*b*) applied to very large microscopic image analysis. Such analysis of different colour models is needed in order to carry out a successful detection and therefore a classification of different regions of interest (ROIs) within the image.

Methods: All colour models have their advantages and drawbacks. It is necessary to identify which colour model is suitable to represent and reproduce the ROI under consideration for each tissue type and WSI modality. This may be done by analysing the distance colour formulae applied between two colours. The distance considered within this study are: the Euclidean distance for the RGB model, the NBS colour distance formulae for HSI model and the CIEDE2000 for the CIEL*a*b*, colour model. Moreover, another aspect to be considered is how to deal with the colour coordinates, that is as a vector or in a marginal way.

Results : The results applied to microscopic images show that the Euclidean and NBS vector distance for the RGB and HSI model respectively distinguish between different ROIs but the vector CIEDE2000 distance for the CIEL*a*b* model reproduces in a better way the original colour. However, the computational cost of the last one is higher than the other two colour models.

Discussion/Conclusion: Successful detection and therefore a classification of different regions of interest within an image allows both distinguishing possible ROIs and retrieving their proper colour for further ROI analysis. This analysis is not commonly done in many biomedical applications that deal with colour images. Other important aspect is the computational cost of the different processing algorithms according to the colour model. This work takes these aspects into consideration to choose the best colour model tailored to the microscopic stain and tissue type under consideration and to obtain a successful processing of the histological image.

Keywords: Microscopic Image Processing, Whole Slide Colour Imaging, Colour Distances and Models.