Color Space Assessment for Automatic Chronic Wound Segmentation

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Abstract

Chronic wound diagnosis using machine learning is hindered by the lighting and shadows in the captured images. Therefore, this study evaluates the impact of different color spaces on wound segmentation using a U-Net. Results show that the YDbDr color space outperforms RGB.

Keywords: Image segmentation, machine learning, wounds, image color analysis

Introduction

Chronic Wound Segmentation (CWS) using machine learning allows precise monitoring of wound area, critical for healing [1].

Most datasets are collected with digital cameras without a standardized protocol, leading to variability from lighting and shadows [2].

Such inconsistencies affect segmentation models, which often fail with non-standardized images [2].

Representing images in different color spaces (CS) mitigates lighting effects, improves accuracy, and enables automatic segmentation [2][3].

Materials & Methods

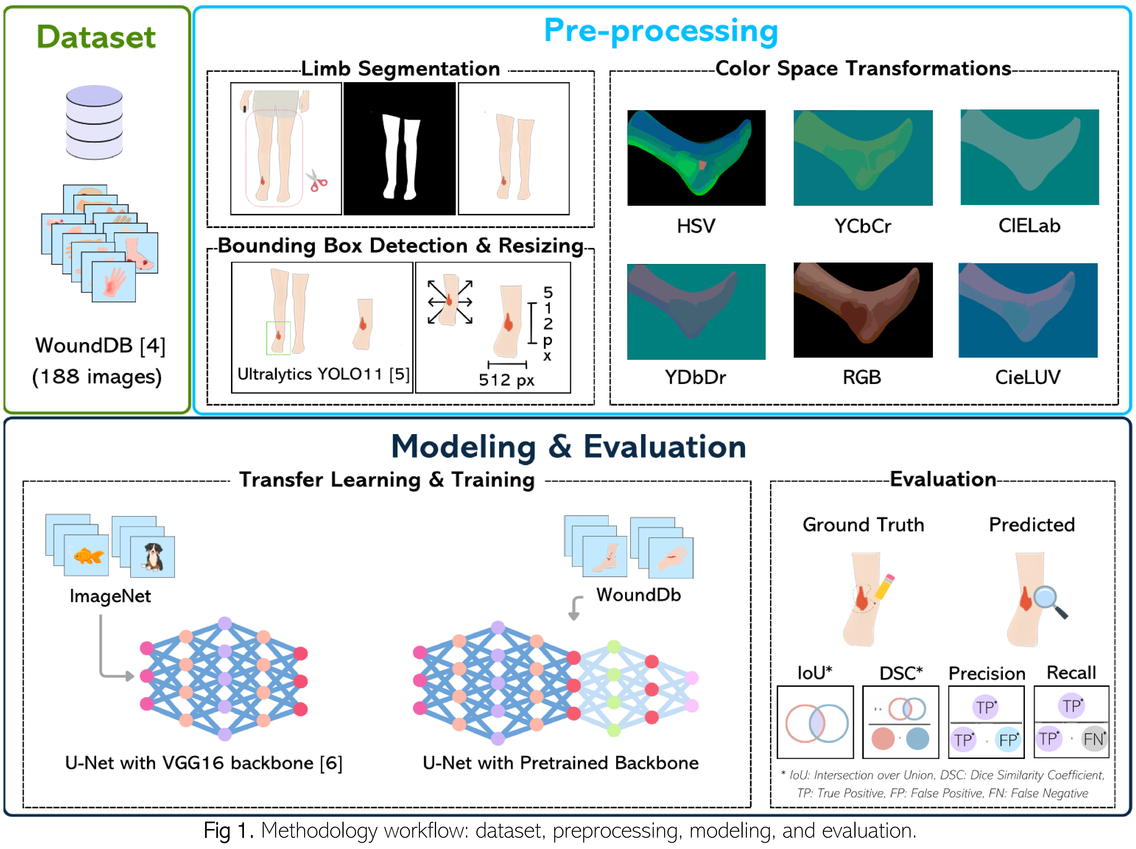

Fig 1. Methodology workflow: dataset, preprocessing, modeling, and evaluation.

Results & Discussion

- YDbDr demonstrated the highest performance, while CIELab showed the lowest as seen in Table 1.
- YDbDr achieved an increase of 0.0134 for IoU and 0.0086 DSC over the RGB.
- In recent experiments by [1] with CS on a different database, merging YCbCr and CIELab resulted in an increase of 0.018 for IoU and 0.02 for DSC.

Table 1. Performance Metrics of the Segmentation Model

Color Spaces	Metrics			
	IoU	DSC	Precision	Recall
HSV	0.7221	0.8386	0.9035	0.7825
CIELab	0.6944	0.8196	0.8428	0.7977
RGB	0.7618	0.8648	0.9106	0.8234
YCbCr	0.7266	0.8416	0.9212	0.7747
YDbDr	0.7752	0.8734	0.9092	0.8402
CieLUV	0.7354	0.8475	0.9034	0.7981

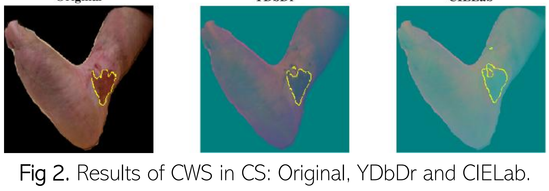

Fig 2. Results of CWS in CS: Original, YDbDr and CIELab.

Conclusions

This study evaluated which color space is more adequate for CWS when there is no standardized protocol and there are lighting problems. Results indicate YDbDr improve segmentation over RGB, which is the usual CS for CWS, the limited size of the dataset suggests further validation.

References

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