INTRODUCTION

• Diabetic foot ulcers (DFU) lead to millions of amputations every year
• Current clinical practices still remain mostly based on visual examination of the wound
• We propose an end-to-end automatic segmentation and tissue classification of ulcers using superpixel-based training of FCN using a small database of 219 images.
• The proposed method outperforms state-of-the-art FCN models while improving significantly the performance on all metrics.

PROPOSED METHOD

• First, we identify the ulcer area to eliminate all background elements that may threaten the classification.
• Second, we adopt SLIC to generate homogenous superpixels from the ROI.
• Third, the generated superpixels will be used as input to feed the state-of-the-art FCNs.
• Finally, a class label will be assigned to each superpixel depending on its dominant color (red, yellow or black).

DISCUSSION AND CONCLUSION

• We presented a novel approach for automatic diabetic foot ulcer segmentation and tissue classification. The proposed method was performed by a superpixel-based semantic segmentation using fully convolutional networks.
• Our segmentation method exhibits higher performance than the existing state-of-the-art FCN methods regarding all the metrics. Tissue segmentation precision was significantly improved.
• A fusion of superpixels and a classic FCN-32 network helped to improve its accuracy by 8.13% to reach 92.68% and led to a high DICE score of 75.74% instead of 54.31%.
• Unlike the existing methods in literature which deal with slough tissue due to the different textures related to it, our method is capable of segment it with the highest DICE score of 77.5%.
• Qualitative results reveal robust tissue identification effectiveness and the potential of our method to produce an accurate segmentation with a very high precision regarding the three classes.
• The used system is embedded into a smartphone with add-on temperature sensor and could be used by clinicians during diabetic foot examination for an accurate and complete assessment from ulcer delineation, surface and temperature measurements to tissue area identification and analysis.

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