Image Denoising for Smart Laser Osteotomy Using Deep Learning-based Fast Optical Coherence Tomography (OCT)

Publisher: IEEE Cite This PDF

Shubhangi N. Ghate ; D. Kalpanadevi ; K Amudha ; Priya Velayutham ; Balu S ; Mohd Asif Shah All Authors

115
Full
Text Views

Abstract

Document Sections

I. Introduction

II. Methodology

III. Experimental setup

IV. Performance evaluation

V. Conclusion

Authors

Figures

References

Keywords

Metrics

More Like This

Abstract:
With laser osteotomy, patients may expect clean incisions and minimal damage to bone structure. With the smart laser osteotomy method, this study has suggested using Optical Coherence Tomography (OCT) to track the ablation as it occurred. The OCT image is useful for distinguishing different types of tissue and giving the ablation laser guidance on where to focus its energy to avoid damaging vital structures like bone marrow and nerves. Furthermore, the application relies on the quality of the OCT picture to determine the tissue classifier's exactness. Because of this, establishing a reliable feedback system depends heavily on picture denoising. The frame averaging approach is widely utilized as a means of picture denoising in Optical Coherence Tomography (OCT). The more photographs that are used, the better the final image will seem. However, this method requires more time to acquire data and makes the system more vulnerable to motion abnormalities. To get around these restrictions, a deep learning denoising algorithm is used to simulate the frame-averaging approach. The generated image was of higher quality than traditional digital filtering techniques while maintaining the same level of detail as when using a frame-averaging approach. This study also analyzes how the proposed strategy impacts the precision of the tissue classifier model to inform the ablation laser's adjustments. After applying image denoising, a significant improvement has been observed in the tissue classifier's performance. It is also evident that the classifier trained with deep learning denoised images was as accurate as the classifier trained with frame-averaged images.

Published in: 2023 Second International Conference on Electronics and Renewable Systems (ICEARS)

Date of Conference: 02-04 March 2023

DOI: 10.1109/ICEARS56392.2023.10085568

Date Added to IEEE *Xplore*: 05 April 2023

Publisher: IEEE

ISBN Information:

Conference Location: Tuticorin, India

Recommended for You (Beta)

Improving IoT Security - A Smart Intrusion Detection System Utilizing Deep…

A Network Based Intrusion Detection System For Internet Of Medical Things Using Deep Learning…

Building AI-Driven Frameworks for Real-Time Threat Detection and Mitigation in IoT Networks

Learn More

Sign in to Continue Reading

Authors

Figures

References

Keywords

Metrics



© Copyright 2026 IEEE - All rights reserved, including rights for text and data mining and training of artificial intelligence and similar technologies.