A Hand-held Optical Coherence Tomography Angiography Scanner based on Angiography Reconstruction Transformer Networks

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Abstract

Optical coherence tomography angiography (OCTA) has successfully demonstrated its viability for clinical applications in dermatology. Due to the high optical scattering property of skin, extracting high-quality OCTA images from skin tissues requires at least six-repeated scans. While the motion artifacts from the patient and the free hand-held probe can lead to a low-quality OCTA image. Our deep-learning-based scan pipeline enables fast and high-quality OCTA imaging with 0.3-second data acquisition. We utilize a fast scanning protocol with a 60 μm/pixel spatial interval rate and introduce Angiography-Reconstruction-Transformer (ART) for 4× super-resolution of low transverse resolution OCTA images. The ART outperforms state-of-the-art networks in OCTA image super-resolution and provides a lighter network size. ART can restore microvessels while reducing the processing time by 85%, and maintaining improvements in structural similarity and peak-signal-to-noise ratio. This study represents that ART can achieve fast and flexible skin OCTA imaging while maintaining image quality.

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