F54 Correction of a Type of Distortion Seen in Bitemark Photography: A Novel Algorithm With a Formal Proof

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The goals of this presentation are to inform odontologists and other practitioners who take photographs of patterned injuries on human skin of a new method to correct one type of distortion often seen in patterned injury photography and to inform practitioners of a method to improve the utility of patterned injury images with Type 1 distortion.

This presentation will impact the forensic science community by providing a reliable and repeatable method to rectify Type 1 distortion in bitemark and other patterned injury photographs that include the American Board of Forensic Odontology (ABFO) No. 2© scale. The method is supported by a rigorous proof of correctness.

The technique allows the user to specify correspondence between four or more points in a digital photograph (or digitized film image) and a computer-generated model of the ABFO No. 2© scale present in the photograph. This correspondence yields a mapping between the plane of the scale in the photograph and the plane of the film or image sensor in the camera.

The eight-parameter transformation between perspective planes is algebraically rearranged to yield two linear combinations of the eight parameters of the transformation. The mappings derived from user input are substituted into the linear combinations to create eight or more linear equations of the eight parameters of the transform. The parameters of the transformation are estimated using multiple linear regression. Once the transform is known, multiple practical applications are facilitated including rectification, measurement, and image comparison.

In contrast to prior methods, this technique can be completed in minutes and reliably rectifies this type of distortion. Images captured by as much as 80° from the optimal angle have been rectified. The eight-parameter transformation between perspective planes is an effective technique to rectify Type I distortion in patterned injury images utilized in forensic odontology.

Bitemarks, Patterned Injuries, Photographic Distortion

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