Application of Signature Curves to Characterize Melanomas and Moles

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Noninvasive diagnosis of melanoma persists as a challenge for dermatologists because of the structural differences between benign and malignant skin lesions are often indistinguishable to the human eye. This research focuses on the application of a 2D invariant curve, called the "signature curve", formed by taking curvature and derivative of curvature with respect to arc length of a closed curve: (κ, κ_s), [1, 2]. We can calculate the extended signature curves of the contours of the skin lesions [3] to detect asymmetry, border irregularity and diameter size of the skin lesions. In this paper, by analyzing the signature curves of 50 benign moles and 50 melanomas, we can show that the benign and malignant lesions have contrasting global and local symmetry patterns in their signature curves, [4]. Furthermore, regular moles are distinctive by a high degree of global symmetry whereas, melanomas exhibit multiple types of local symmetry embedded within their signature curves. We will then use ROC Analysis, a key statistical tool for evaluating detection, to characterize our diagnostic performance.

References

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