Adaptive Multi Sigmoid Contrast Enhancement

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Adaptive Multi Sigmoid Contrast Enhancement (AMSCE) is a novel algorithm that may improve the analysis of computed tomography (CT) scans. Contrast enhancement compensates for human or machine deficiencies in imagery, like distorted brightness, etc; it is necessary for computer vision software and humans that need to analyze imagery. Current algorithms are too computationally complex or produce many artifacts given particular brightness distributions. The proposed algorithm divides an image's brightness histogram into adaptively determined regions based on the mean and standard deviation and separately enhances each region. CT imagery tends to have distinct regions of brightness, so the regions are intended to best enhance such imagery. Each region is then enhanced by sigmoid enhancement, an algorithm which tends to over-enhance images to the point of distortion; but it may on small scales improve the clarity of the image. Parameters for the sigmoid function and the bounds of the regions are selected adaptively to best enhance the target CT imagery. AMSCE qualitatively enhances the image with varying distributions of brightness to the same level as other leading algorithms, while avoiding distortions. It performs well on CT imagery, but may over enhance non-CT imagery. By the quantitative image measures though, AMSCE slightly underperforms the leading algorithms. However, its low computational complexity and its tendency to avoid contrast distortions and artifacts indicate that as a framework it may be a significant tool for image enhancement. Further parameter adjustment and clinical study will be necessary to further develop the algorithm.

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