NEW FRACTIONAL DERIVATIVE HYBRID METHODS FOR IMAGE ENHANCEMENT

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Medical images are susceptible to noise, distortions and have low resolutions. It is important to process the medical images to improve their visual appearance, quality and identify the region of interest thereby assisting the medical specialist for easier interpretation of diseases. Image enhancement procedures are mathematical techniques used to make the given image more precise, so that the selected features of the image can be easily identified by the human eye or to be detected by automated diagnosis systems.

The primary objective of this research is to focus on the design of new fractional differential filters for various image processing applications, especially in the field of medical imaging. The thesis, first analyzes the effectiveness and use of Grunwald-Letnikov (G-L) fractional differential operator for retinal image enhancement. Next, three new hybridized fractional differential masks using Gauss interpolation, are designed to improve the performance of existing fractional differential based image enhancement operators. This is an improved hybrid version of Gauss interpolation with the existing Grunwald-Letnikov fractional differential operator, Riemann-Liouville fractional differential operator and Riesz fractional differential operator. A new generalized mask of size n x n is also uniquely designed for image enhancement.

In the next chapter, a new hybridized image enhancement method is developed using Singular Value Decomposition (SVD) and fractional derivatives. The combination of fractional differential mask and SVD improves the visual quality of the image to a greater extent. Finally, three new hybrid methods combining Stirling's interpolation with the existing G-L fractional differential operator, R-L fractional differential operator and Riesz fractional differential operator has been developed to enhance the low contrast images. The new generalized mask of fractional derivative not only enhances the image, but also suppresses the noises effectively. Experimental results of

the proposed methods are compared with the existing contemporary methods using standard metrics, in all the chapters.