

# Coherence-Enhancing Diffusion Filtering

## Members:

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## Brief Description:

Coherence-Enhancing Diffusion Filtering is used in completion of interrupted lines or the enhancement of flow-like structures. Such enhancement is a challenging task in computer vision, human vision, and image processing. We will perform anisotropic diffusion of 2D image which will reduce the noise in the image while preserving the region edges and will smooth along the image edges removing gaps due to noise.

## Experimental results :

Original



Enhanced



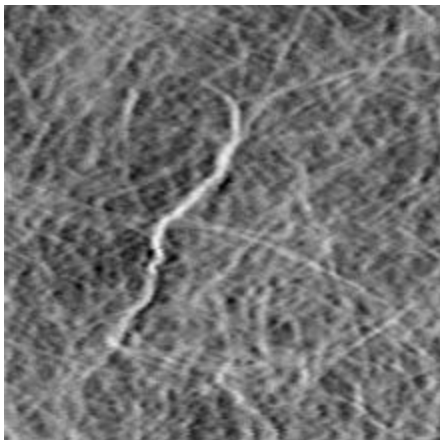
Original



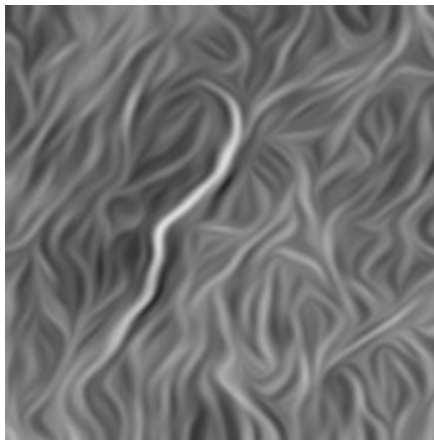
Enhanced



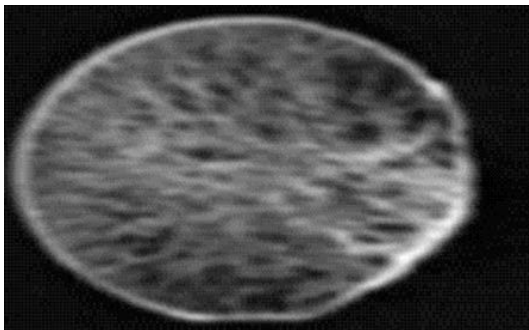
Original



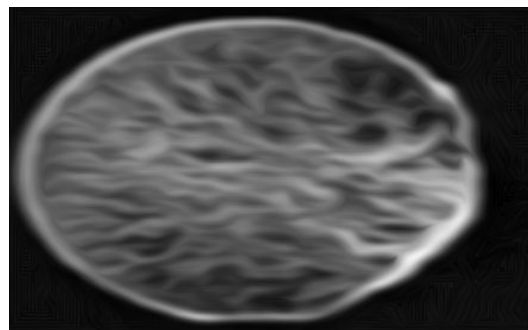
Enhanced



Original



Enhanced



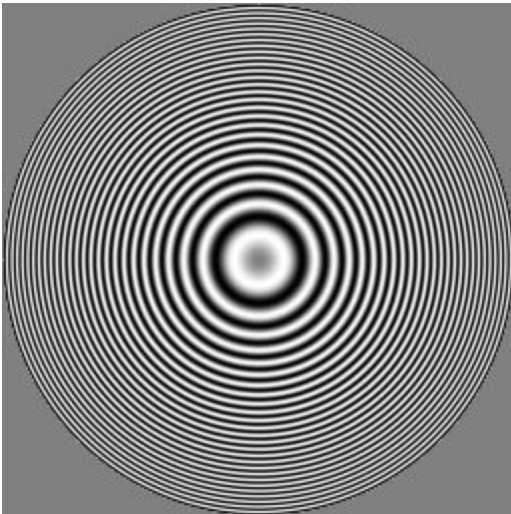
Original



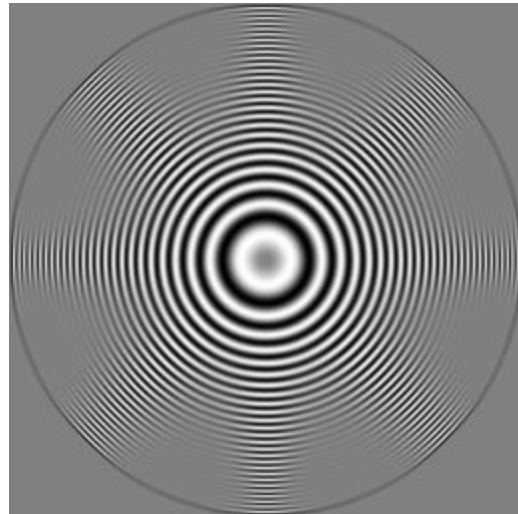
Enhanced



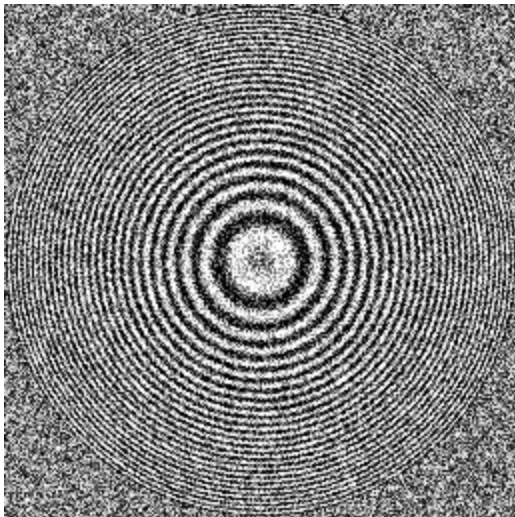
Original



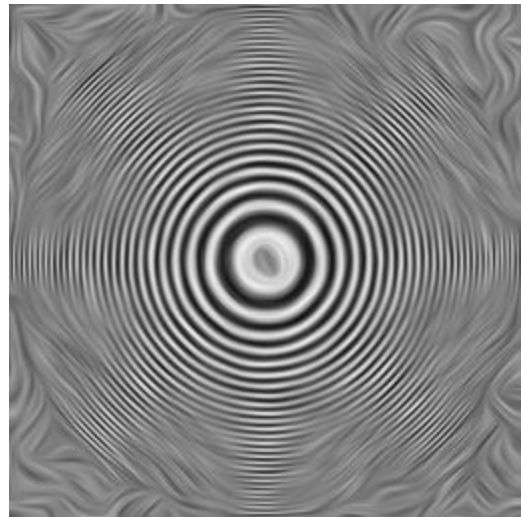
Enhanced



Original



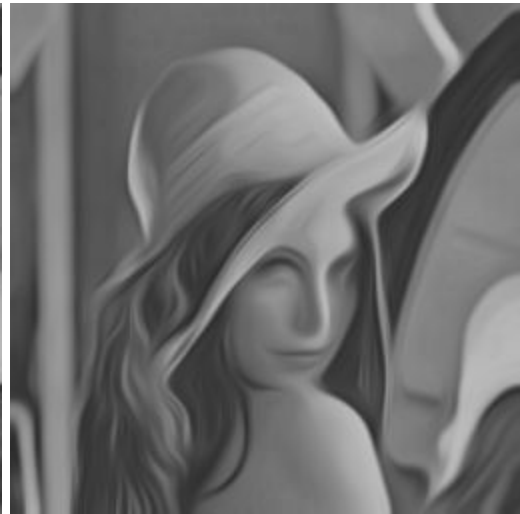
Enhanced



Original



Enhanced



CED Algorithm:

Calculation of the structure tensor in each pixel. This requires one convolution with a Gaussian  $K^{3/4}$ , and summation of k from 1 to m(here 2) convolutions with  $K^{1/2}$ . The convolutions were implemented in the spatial domain exploiting the separability and symmetry of the Gaussian.

Principal axis transformation of the structure tensor in each pixel.

Calculation of the diffusion tensor in each pixel.

Use Non -negative Discretization :

$\frac{ b_{i-1,j+1}  - b_{i-1,j+1}}{4} + \frac{ b_{i,j}  - b_{i,j}}{4}$	$\frac{c_{i,j+1} + c_{i,j}}{2} - \frac{ b_{i,j+1}  +  b_{i,j} }{2}$	$\frac{ b_{i+1,j+1}  + b_{i+1,j+1}}{4} + \frac{ b_{i,j}  + b_{i,j}}{4}$
$\frac{a_{i-1,j} + a_{i,j}}{2} - \frac{ b_{i-1,j}  +  b_{i,j} }{2}$	$\begin{aligned} & - \frac{a_{i-1,j} + 2a_{i,j} + a_{i+1,j}}{2} - \\ & \frac{ b_{i-1,j+1}  - b_{i-1,j+1} +  b_{i+1,j+1}  + b_{i+1,j+1}}{4} - \\ & \frac{ b_{i-1,j-1}  + b_{i-1,j-1} +  b_{i+1,j-1}  - b_{i+1,j-1}}{4} + \\ & \frac{ b_{i-1,j}  +  b_{i+1,j}  +  b_{i,j-1}  +  b_{i,j+1}  + 2 b_{i,j} }{2} - \\ & \frac{c_{i,j-1} + 2c_{i,j} + c_{i,j+1}}{2} \end{aligned}$	$\frac{a_{i+1,j} + a_{i,j}}{2} - \frac{ b_{i+1,j}  +  b_{i,j} }{2}$
$\frac{ b_{i-1,j-1}  + b_{i-1,j-1}}{4} + \frac{ b_{i,j}  + b_{i,j}}{4}$	$\frac{c_{i,j-1} + c_{i,j}}{2} - \frac{ b_{i,j-1}  +  b_{i,j} }{2}$	$\frac{ b_{i+1,j-1}  - b_{i+1,j-1}}{4} + \frac{ b_{i,j}  - b_{i,j}}{4}$