Bilateral Filtering

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A bilateral filter is a non-linear, edge-preserving, and noise-reducing smoothing filter for images. It replaces the intensity of each pixel with a weighted average of intensity values from nearby pixels. This weight can be based on a Gaussian distribution. Crucially, the weights depend not only on Euclidean distance of pixels, but also on the radiometric differences. This preserves sharp edges, as is shown at Fig. 1.

In mathematics, the Euclidean distance or Euclidean metric is the "ordinary" straight-line distance between two points in Euclidean space. And the Euclidean distance between points p and q is the length of the line segment connecting them.

Figure 1: Left: original image. Right: image processed with bilateral filter