Assignment 02

Alignment and Fitting

submitted for

EN3160 - Image Processing and Machine Vision

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Progress on GitHub

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Question 01 We construct the scale-normalized (Lindeberg, 1998) LoG kernel given by

$$L_\sigma[x, y] = \sigma^2 \times \left[\frac{x^2 + y^2 - 2\sigma^2}{2\pi\sigma^6}\right] \exp\left[-\frac{x^2 + y^2}{2\sigma^2}\right],$$

convolve the image with it at several scales and square the response at each scale, to construct the squared normalized LoG scale-space $S[x, y, \sigma]$ of the image.

Each $[x, y, \sigma]$ in the scale-space is compared with the 26 neighbors adjacent to it, and flagged as a local maximum if $S[x, y, \sigma]$ is greater than its values at the neighbors. We have shown in the Jupyter Notebook that such a maximum may be interpreted as the presence of a blob with radius $\sigma\sqrt{2}$ at image coordinates $[x, y]$.

We construct the scale-space with $\sigma \in [1, 11]$. Figure 1 shows the blobs detected at each value of σ, with a circle with radius $\sigma\sqrt{2}$ round it.

Figure 1: Blobs detected at various scales

The blob with the largest radius was found corresponding to $\sigma = 8$, with a radius of around 11.31 pixels.

Question 02

Question 03

Question 04