Computer Vision Assignment 1: Filtering

Robrecht Jurriaans (5887380), Taco Cohen (6394590)

November 5, 2012

1 Gaussian Filters

1.1 1D Gaussian Filter

We implemented the 1D Gaussian in `gaussian.m`. We made sure the kernel size is about $3 * \sigma$ and is always odd. For this purpose we used the formula $2 * \lfloor 1.5 * \sigma \rfloor + 1$.

Because the filter has a finite size, the sum of the filter values will not be one in a naive implementation. For this reason, we must normalize the kernel after calculating the values of the Gaussian at each kernel entry. To save computation, we used the following equality:

$$\begin{aligned}\frac{G_\sigma(x)}{\sum_{x'=-h}^{h} G_\sigma(x')} &= \frac{\frac{1}{\sigma\sqrt{2\pi}} \exp(-\frac{x^2}{2\sigma^2})}{\sum_{x'=-h}^{h} \frac{1}{\sigma\sqrt{2\pi}} \exp(-\frac{x'^2}{2\sigma^2})} \\ &= \frac{\exp(-\frac{x^2}{2\sigma^2})}{\sum_{x'=-h}^{h} \exp(-\frac{x'^2}{2\sigma^2})}\end{aligned}$$

1.2