附加材料 1

快速导向滤波算法的具体步骤与导向滤波基本相同,下划线部分的语句的为与导向滤波不同的地方.

步骤 1) $\underline{I' = \mathrm{fsubsample}(I,\ s);}$ $\underline{p' = \mathrm{fsubsample}(p,\ s);}$ $\underline{r' = r/s;\ I' = f_{\mathrm{subsample}}(I,\ s);}$ $\underline{p' = f_{\mathrm{subsample}}(p,\ s);}$ $\underline{r' = r/s}$

步骤 2) $\mathrm{mean}I = f\mathrm{mean}(I',\ r')$; $\mathrm{mean}p = f\mathrm{mean}(p',\ r')$; $\mathrm{corr}I = f\mathrm{mean}(I'.*I',\ r')$; $\mathrm{corr}Ip = f\mathrm{mean}(I'.*p',\ r')$; $mean_I = f_{mean}(I',\ r')$; $\mathrm{mean}_p = f_{mean}(p',\ r')$; $\mathrm{corr}_I = f_{mean}(I'.*I',\ r')$; $\mathrm{corr}_{Ip} = f_{mean}(I'.*p',\ r')$

步骤 3) $\mathrm{var}I = \mathrm{corr}(I) - \mathrm{mean}(I).*\mathrm{mean}(I)$; $\mathrm{cov}Ip = \mathrm{corr}Ip - \mathrm{mean}I.*\mathrm{mean}p$; $\mathrm{var}_I = \mathrm{corr}_I - mean_I.*mean_I$; $\mathrm{cov}_{Ip} = \mathrm{corr}_{Ip} - mean_I.*\mathrm{mean}_p$;

步骤 4) $a = \mathrm{cov}Ip./(\mathrm{var}I + \varepsilon)$; $b = \mathrm{mean}p - a.*\mathrm{mean}I$; $a = \mathrm{cov}_{Ip}./(\mathrm{var}_I + \varepsilon)$; $b = \mathrm{mean}_p - a.*mean_I$

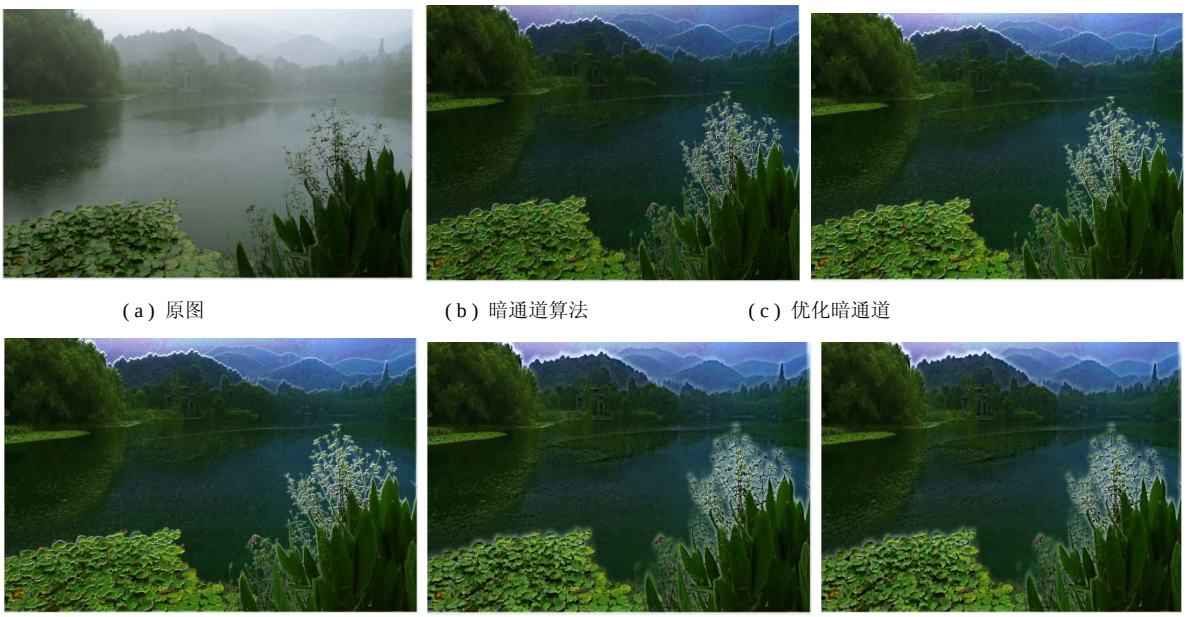
步骤 5) $\mathrm{mean}a = f\mathrm{mean}(a,\ r')$; $\mathrm{mean}b = f\mathrm{mean}(b,\ r')$; $\mathrm{mean}_a = f_{\mathrm{mean}}(a,\ r')$; $\mathrm{mean}_b = f_{\mathrm{mean}}(b,\ r')$

步骤 6) $\underline{\mathrm{mean}a = f\mathrm{upsample}(\mathrm{mean}a,\ s);}$ $\underline{\mathrm{mean}b = f\mathrm{upsample}(\mathrm{mean}b,\ s);}$ $\underline{\mathrm{mean}_a = f_{\mathrm{upsample}}(\mathrm{mean}_a,\ s);}$ $\underline{\mathrm{mean}_b = f_{\mathrm{upsample}}(\mathrm{mean}_b,\ s)}$

步骤 7) $q = \mathrm{mean}a.*I + \mathrm{mean}b$; $q = \mathrm{mean}_a.*I + \mathrm{mean}_b$

其中，p 为滤波图像；I 为导向图像；s 为采样率；I'为二次采样后的导向图；p'为二次采样后的输入滤波图；r'为二次采样后的窗口半径；f_{mean} 为窗口半径为 r 的均值滤波器；corr()为相关函数；var()为方差；cov()为协方差函数；ε 为防止 a_k 过大的正规化参数.

附加材料 2



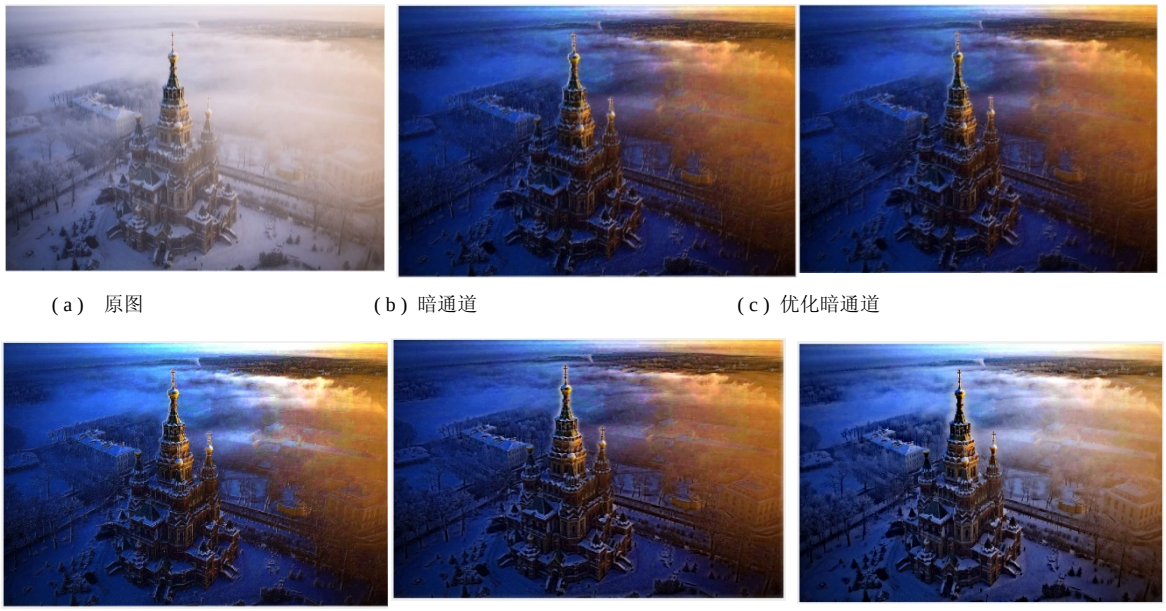
(a) 原图 (b) 暗通道算法 (c) 优化暗通道

(d) 优化大气光 (e) 优化透射率 (f) 本研究算法

雨天有雾图像的去雾效果图

Defogging effect pictures of foggy images in rainy day

附加材料 3



(a) 原图　(b) 暗通道　(c) 优化暗通道

(d) 优化大气光　(e) 优化透射率　(f) 本研究算法

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Defogging effect pictures of foggy images in snowy day