论文与报告

基于物理模型的快速单幅图像去雾方法

禹晶, 李大鹏, 廖庆敏

1. 清华大学电子工程系 北京 100084

2. 北京工业大学计算机学院 北京 100124

3. 清华大学深圳研究生院 深圳 518055

摘要
在雾、霾等天气条件下, 大气粒子的散射作用导致捕获的图像严重降质. 本文提出一种新的基于物理模型的快速单幅图像去雾算法. 该算法从大气散射模型出发, 通过对大气光照进行白平衡, 从而简化大气散射模型; 利用快速双边滤波方法估计大气耗散函数, 进而恢复场景反照率. 本文算法的时间复杂度达到图像像素数的线性函数, 具有很快的执行速度. 实验结果表明本文算法有效地恢复了场景的对比度和颜色, 从而明显地提高了图像的视见度.

关键词　 图像去雾　 视见度　 大气散射模型　 双边滤波　 白平衡

分类号

Physics-based Fast Single Image Fog Removal

YU Jing, LI Da-Peng, LIAO Qing-Min

1. Department of Electronic Engineering, Tsinghua University, Beijing 100084

2. College of Computer Science and Technology, Beijing University of Technology, Beijing 100124

3. Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055

Abstract
Imaging in the atmosphere is often degraded by scattering due to atmospheric particles such as haze, fog, and mist. In this paper, we propose a novel fast defogging method based on the atmospheric scattering model. The white balance is performed and the atmospheric scattering model is simplified prior to visibility restoration. In the inference process of the atmospheric veil, the coarser estimate is refined using a fast bilateral filtering approach that preserves edges. Finally, the scene albedo is recovered by inverting this simplified model. The complexity of the proposed method is only a linear function of the number of input image pixels and this allows a very fast implementation. Results on a variety of outdoor foggy images demonstrate that the proposed method achieves good restoration for contrast and color fidelity, resulting in a great improvement in image visibility.

Key words　 Image defogging　 visibility　 atmospheric scattering model　 bilateral filter　 white balance

通讯作者　 禹晶 j-yu08@mails.tsinghua.edu.cn

作者个人主页　 禹晶; 李大鹏; 廖庆敏