Fast Image Dehazing Method Based on Linear Transformation

Abstract:

Images captured in hazy or foggy weather conditions are seriously degraded by the scattering of atmospheric particles, which directly influences the performance of outdoor computer vision systems. In this paper, a fast algorithm for single image dehazing is proposed based on linear transformation by assuming that a linear relationship exists in the minimum channel between the hazy image and the haze-free image. First, the principle of linear transformation is analyzed. Accordingly, the method of estimating a medium transmission map is detailed and the weakening strategies are introduced to solve the problem of the brightest areas of distortion. To accurately estimate the atmospheric light, an additional channel method is proposed based on quad-tree subdivision. In this method, average grays and gradients in the region are employed as assessment criteria. Finally, the haze-free image is obtained using the atmospheric scattering model. Numerous experimental results show that this algorithm can clearly and naturally recover the image, especially at the edges of sudden changes in the depth of field. It can, thus, achieve a good effect for single image dehazing. Furthermore, the algorithmic time complexity is a linear function of the image size. This has obvious advantages in running time by guaranteeing a balance between the running speed and the processing effect.

Keywords :

Atmospheric modeling, Scattering, Filtering, Computational modeling, Image restoration, Image color analysis, Meteorology.