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Regularized Dehazing

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Abstract

When imaging in scattering media, the visibility degrades as objects become more distant. Visibility can be significantly restored by computer vision methods that account for physical processes occurring during image formation. Nevertheless, such recovery is prone to noise amplification in pixels corresponding to distant objects, where the medium transmittance is low. In this work we analyze the nature of this noise amplification. We then present an adaptive filtering approach that counters the above problems: while greatly improving visibility relative to raw images, it inhibits noise amplification. Essentially, the recovery formulation is regularized, where the regularization adapts to the spatially varying medium transmittance. Thus, this regularization does not blur close-by objects. We demonstrate the approach in experiments where the scene radiance and distance map are recovered in haze and underwater.

Keywords: Physics based vision, Color, Polarization, Vision in Bad Weather, Inverse problems, Dehazing, Defogging.