Visibility Restoration for Real-world Hazy Images via Improved Physical Model and Gaussian Total Variation

Chuan LI, Enping HU, Xinyu ZHANG, Hao ZHOU, Hailing XIONG, Yun LIU

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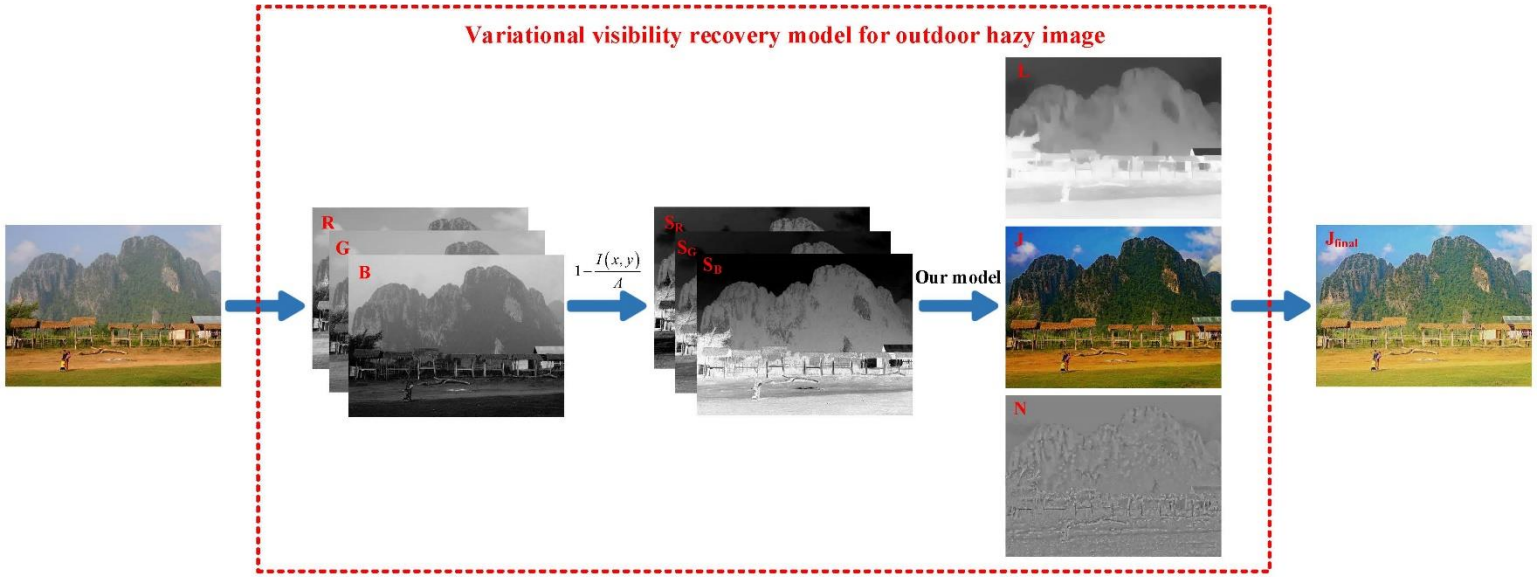
Problems & Ideas

- Problems of conventional visibility restoration methods:
  - Most existing physical models fail to take the noise interference into account for real-world haze conditions.
  - Existing haze removal methods are prone to noise amplification in the restoration results.
- Ideas: A unified variational model consisting of multiple effective constraints that simultaneously achieves haze removal and noise suppression.



The flowchart of the proposed visibility restoration algorithm for real-world hazy images.

Main Contributions

- Contributions:
  - Different from the classic atmospheric scattering model, the inevitable noise is considered and incorporated into the classic physical model;
  - A unified variational model consisting of multiple effective constraints is proposed to simultaneously achieve haze removal and noise suppression;
  - Extensive experiments on real-world hazy images demonstrate superior performance on visibility restoration and noise suppression, proving its effectiveness.

Real-world hazy images (top) and corresponding visibility restoration results (bottom) using our proposed unified variational model