In this work, we aim to develop a potentially real-time algorithm for improving the visibility of images captured in a scattering environment, such as turbid water. As will be seen later, the dehazing problem is highly correlated with depth. For this purpose, we propose light-field imaging realized by an affordable compact plenoptic camera, i.e. Lytro Illum [1].

Related work

Single image methods [2, 3] lack the depth information, hence they assume some priors to be able to solve the problem. Polarizer-based methods [4] demand the effort to capture multiple images while rotating the polarizer in front of the sensor and therefore, are obviously not real-time.

Contribution

Thanks to the plenoptic camera capturing an array of images in one shot, we develop a real-time algorithm for dehazing. In this framework, having increased the recorded input scene information without trading-off the time, we can apply our dehazing algorithm to any arbitrary scene with no priorities.

Proposed algorithm

Input: $I(x)$ Captured image
Output: $J(x)$ Dehazed image, $d(x)$ Depth map

Given ambient light $A$ and parameters of medium:

1. Initiating a fixed depth value $z_{\text{ref}}$
2. Deriving 1-order restored image $J_1$ based on $z_{\text{ref}}$
3. Using $J_1$ to compute a depth map $d_1$
4. Enhancing depth map $d_1$ based on the transmission cue method in [5]
5. Using improved depth map to compute the finally restored image $J(x)$

Results taken from [5]

Bibliography

[1] https://support.lytro.com/