Underwater Image Enhancement Based on Attention Mechanism and Multi-scale Generative Adversarial Network

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With the development of ocean exploration, in recent years, people have relied on underwater robots for resource exploration, environmental surveying and other activities. However, due to the underwater medium and a large number of suspended particles, the light is absorbed and scattered in the water. Therefore, the original underwater image has suffered serious degradation, such as color distortion, low contrast, and blurred images. In order to obtain a clear underwater scene, it is of great significance and value to adopt underwater image enhancement technology.

Underwater image enhancement technology mainly includes traditional methods and deep learning methods. Traditional methods perform overall modeling of underwater scenes and invert the degradation process based on physical models; deep learning methods are based on each pixel value of the whole image, learning the mapping relationship between underwater images and original images. But for most backgrounds, such as water, its color is often not our focus. Compared with the whole part, we focus on the more important parts.

In this paper, we propose a novel improvement on Generative Adversarial Networks that can be simply embedded in existing neural networks and can distinguish the foreground and background parts of an image without additional processing.

Through this optimization, which pay more attention to foreground and enhance the details. we make our generative adversarial network achieve better visual performance when the SSIM, PSNR and other indicators are the close or even inferior to other networks and achieves better performance in color correction and detail preservation. We also demonstrate the effectiveness of our proposed attention module and multi-scale module through ablation experiments.