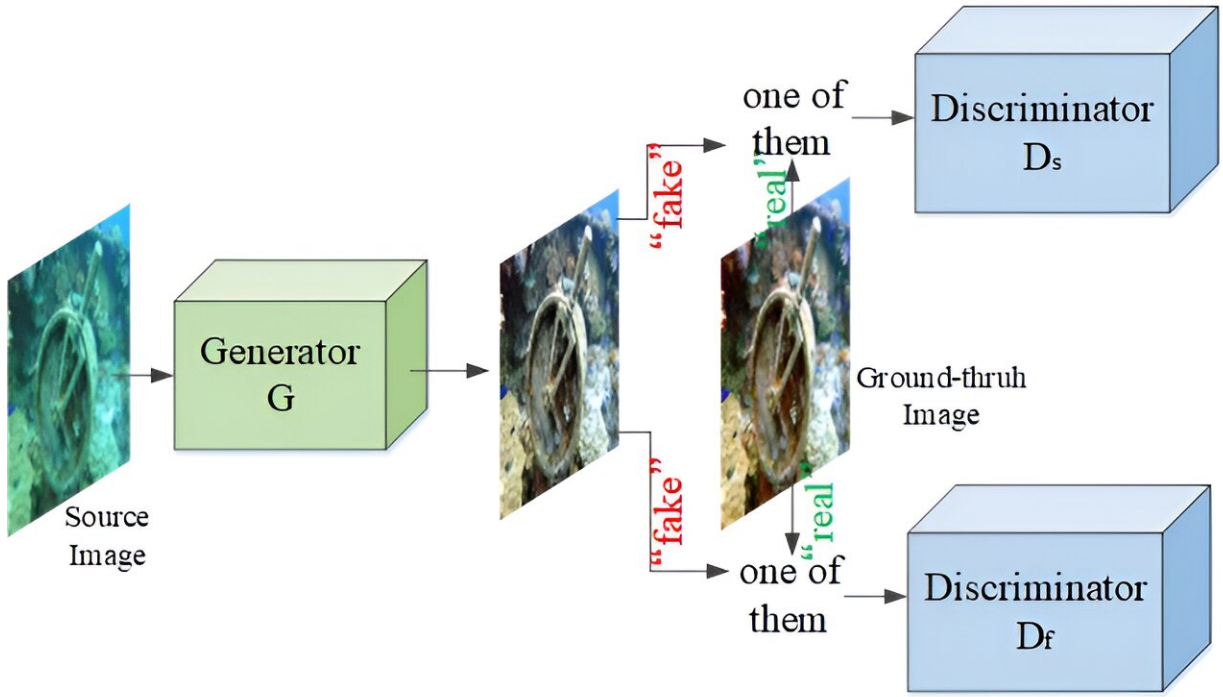
Novel network proposed to improve underwater image quality

June 26 2024, by Zhang Nannan



The overall architecture of the LFT-DGAN network. Credit: Wang Liusan

Researchers led by Prof. Wang Rujing and Wang Liusan from the Hefei Institutes of Physical Science of the Chinese Academy of Sciences have established a learnable full-frequency transformer dual generative adversarial network (LFT-DGAN) to address the problem of underwater image quality degradation caused by various interferences.

The results

were published in *Frontiers in Marine Science*.

Underwater image enhancement technology aims to optimize the quality of underwater images to meet the diverse needs of marine scientific research, underwater robotics and object recognition. Due to the unique underwater environment, noise and color deviation often affect images, making enhancement extremely difficult. It is necessary to improve the quality of underwater images.

In this study, the researchers used the knowledge of reversible convolutional and adversarial neural networks to establish a dual-generative adversarial neural

network model of the full frequency transformer and verified its effectiveness by comparing several underwater image experimental data.

Using this model, they applied image decomposition technology with reversible convolution for the first time to accurately separate the different frequency features of the image.

In addition, the researchers used an advanced transformer model that can learn to improve the interaction and integration of different types of information. They also created a dual-domain discriminator to better capture and analyze the frequency characteristics of the images.

"The results of this study and the methods have provided a solid theoretical foundation and strong support for the subsequent research and development of underwater image enhancement," said Wang Liusan.

More information: Shijian Zheng et al, A learnable full-frequency transformer dual generative adversarial network for underwater image

enhancement, *Frontiers in Marine Science* (2024). DOI: 10.3389/fmars.2024.1321549

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