**Analysis of Object Distance Accuracy on Underwater Image Color Restoration**

Kuan, H.W.1\* and Jaw, J.J.2

1Master Student, Department of Civil Engineering, National Taiwan University, Taiwan

2Associate Professor, Department of Civil Engineering, National Taiwan University, Taiwan

\*[garykuan45@gmail.com](file:///C:\Users\user\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\NNUP6BCK\garykuan45@gmail.com)

***ABSTRACT***

Underwater images often exhibit color distortion compared to those captured in air, primarily due to backscatter and light attenuation. Such distortion creates inconveniences in many fields, including engineering and archaeology. Therefore, algorithms based on physical models are often used for underwater image color restoration, which require accurate parameter estimation. The object distance between the scene and the camera is also crucial. However, current research lacks an analysis of the accuracy requirements for object distance. Therefore, this study aims to analyze the effect of object distance accuracy on underwater color restoration methods based on physical models, specifically the Sea-thru method. Using photos taken in the air as ground truth images and simulating underwater scenes, we introduce different errors in object distances to examine their effect on color restoration performance using the full-reference metric SSIM. The results of this research provide a reference for the minimum accuracy requirements of object distance to achieve SSIM of at least 0.8, considered a visual satisfaction level, in future research on underwater image color restoration.

**Keywords:** underwater image color restoration, Sea-thru method, object distance