Machine Learning Based HSV Space for YOLOv4 in Underwater Imaging

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Abstract: Underwater Computer Vision system enables to extract data and their nature from submerged artifacts and living organisms under the water. An Autonomous Underwater Vehicle (AUV) is a machine that explores the underwater environment without depending upon any manual control. For AUVs, several computer vision algorithms have been developed for accurate object tracking, but when it comes to underwater imaging, such algorithms outperform due to factors such as light attenuation and absorption as a consequence of the underwater physics of light. The colour spectrum under the water moves down to blue and green colours with respect to the depth of water. Also, the light attenuation is categorised into different zones with respect to water depth. Due to such challenges, synthetic data is essential for accurate underwater object detection and is furthermore helpful in underwater imaging studies. Optimal machine models are developed to predict the accurate hue, value and saturation of a given underwater environment. YOLOv4 is a robust computer vision algorithm backed by darknet53, an end-to-end fully connected network. These predicted parameters are dynamically connected to the image data generator function of YOLOv4 and the computer vision model is subsequently trained. The proposed method is developed and tested with an AUV at different levels of water and the results prove to be accurate when deployed at specific environments.

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