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COLOR IMAGE SEGMENTATION ALGORITHM FOR AUTONOMOUS UNDERWATER VEHICLES

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This paper describes an algorithm for color segmentation of images obtained by the computer vision system of an autonomous underwater vehicle. The main goal of image segmentation is further highlighting (detection) of the desired object, having different color palette in contrast with other (false) objects of the water bottom, in a photo. The essence of the algorithm lies in the construction of histograms of distribution of the frequency of occurences of pixel values in the hue-saturation-value color model. The ratio of such histograms between the detected object and the predominant background allows to highlight (locate) the target object. After the segmentation process the object coordinates and rotation are calculated. For these purpose linear approximation is used on pixels which were processed with filtration algorithm. The filtration consists of sequential removal of rows and columns with minimal sum from the image weight mask, until the required total sum of weights is deleted. This naturally leads to the full zeroing of the images with low total weight sum, which indicates that the object is not present on this image. The advantages of the developed algorithm include high speed of image processing (only a single pass through the image pixels is required), fast training (single pass through the pixels of the training set images), and ease of implementation. The paper provides examples of the algorithm's performance on real photographic images obtained by an underwater vehicle's imaging system, designed for student training and for participating in underwater robotics sports events.

Keywords: color segmentation, image processing, object detection, photo binarization, computer vision system, underwater robot, AUV.

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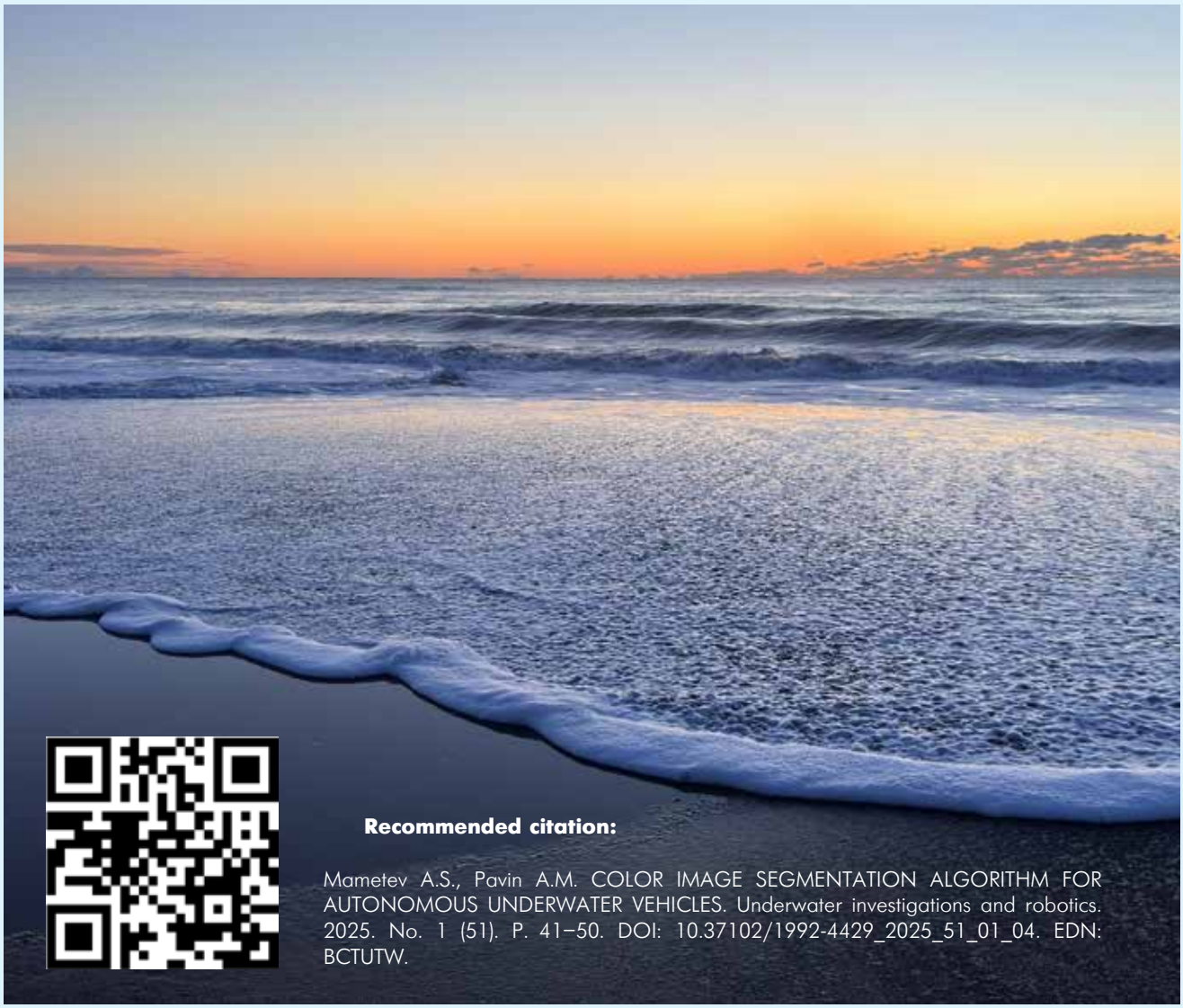

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