A new approach to the classification of marine plastic waste based on high-resolution UAV imagery combined with deep learning algorithms

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SUMMARY

Marine plastic pollution has reached a critical level, representing one of the worst environmental problems of our time. It is recognized as irreversible and globally ubiquitous, affecting marine ecosystems across the world. The 2030 Agenda for Sustainable Development addresses this challenge under Sustainable Development Goal 14 through Target 14.1, which calls for prevention and significant reduction of all forms of marine pollution, particularly plastic litter and other land-based pollutants.

The distribution and composition of marine plastic debris, which vary considerably by season and location, can be classified according to several physicochemical factors including size, origin, source or material composition. While classification based on litter size has been extensively documented, no universally accepted framework yet exists for categorizing different types of marine debris by other parameters.

Remote sensing offers great potential to standardize and scale up the pervious methodologies for monitoring the spatial distribution and composition of marine plastic debris. Although several studies have successfully demonstrated the application of the remote sensing data for detecting and mapping marine plastic, the field remains in an early development phase, requiring further refinement and validation.

In this paper, we propose the marine debris classification strategy according to composite material and develop a methodology for their monitoring based on high-resolution UAV imagery combined with deep learning algorithms. Particular attention is given to island nations, which are especially

vulnerable due to their disproportionate exposure to marine litter, limited waste management infrastructure and strong economic dependence on tourism and fisheries industries.