

HOW DRONES ARE SOLVING THE PROBLEM OF MARINE PLASTIC

USING ARTIFICIAL INTELLIGENCE TO PROCESS DRONE IMAGES is allowing researchers to tackle plastic pollution in the ocean in new ways.

Oceanographers and computer scientists in Japan are

spearheading an initiative to use artificial intelligence (AI) and drone images to measure the problem of plastic waste on beaches and in the ocean. The project is also revealing where and how plastic litter is finding its way into marine environments.

Plastic constitutes 70–80% of all waste in oceans, posing problems for ecosystem and marine life. At the G20 summit in Japan in 2019, 87 countries and regions endorsed the Osaka Blue Ocean Vision, which aims to eliminate new plastic litter entering the oceans by 2050.

“However, no concrete, scientifically grounded proposal has been put forth regarding the specific targets, actions, and extent of reduction required to achieve zero pollution,” says Shin’ichiro Kako, a professor of ocean civil engineering at Kagoshima University, who is leading the new initiative.

Kako explains that our poor understanding of the abundance of plastic entering the marine environment is limiting our ability to find a solution. Current estimates suggest roughly 30 million tonnes of plastic waste enters the environment each year, with 2 million to 12 million tonnes of that ending up in the ocean. However, we do not know how correct these values are.

“The variance in these numbers comes from a lack of a standardized methodology to accurately measure plastic litter across time and space,” Kako says.



▲ Researchers are conducting a pilot project monitoring beach litter on Naru Island, in Japan's far southwest.

He has developed a new method, with the Japan Agency for Marine-Earth Science and Technology, to use drones and AI to understand the extent and sources of marine plastic. Using a dataset of 3,500 images, they trained a deep-learning model to recognize the extent of plastic beach litter based on measurements of shapes and colors in the images.

A technique known as ‘semantic segmentation’ enables the AI to identify and label objects in each image pixel by pixel, assigning them as artificial or natural litter, background, ocean, beach or sky.

By superimposing the results of the deep learning model on to drone images, the system visualizes the distribution of plastic waste within a region, calculating the coverage

of plastic, and estimating the total volume.

Technology for detecting plastics from space using satellite measurements is still in the development stage, says Kako. Additionally, drones provide higher-resolution imagery at a lower cost, although they have a reduced range compared to satellites. “It’s an accessible tool for a broad range of users including non-governmental organizations and not-for-profit organizations, both in terms of technicality and cost,” he says.

The project’s long-term objective is to monitor the flow of waste plastics into oceans, but in the near-term Kako also hopes the tool will assist governments in Japan with waste removal.

On a beach on Naru Island, in Japan’s far southwest, his

team are already running a pilot monitoring programme to estimate the abundance of plastic litter. Since the beach is surrounded by cliffs, it periodically needs heavy machinery transported by ship for waste removal. It is expected that the drones inform the best timing to conduct waste removal based on accumulated litter.

“I envision a system where tools for reducing ocean plastic aren’t exclusive to those with technical knowledge, but are also readily available to municipalities, grassroots organizations and citizen scientists,” says Kako. ■



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