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Plastic waste detection assisted by artificial intelligence

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Plastic pollution has a big impact on living organisms. At the same time, plastics are everywhere in our daily life. For example, plastic is used in packaging, construction of buildings, cars, electronics, agriculture and many other fields. In fact, plastic production has been increasing rapidly since the 1950s. However, plastic waste management strategies have not adapted accordingly to these rising amounts, which end up in the blue and green planet. Unfortunately, for developing nations it is even more complicated and strategies are still developing. Here we investigate the possibilities of plastic waste detection in Cambodia focusing on cities, rivers and coastal areas. Very fine geospatial resolution Red-Green-Blue (RGB) drone imagery was captured over regions of interest in Phnom Penh, Sihanoukville and Siem Reap. To this date, techniques of detecting plastic litter are based on RGB imagery analyses, generating descriptors such as colour, shape, size and form. However, we believe by adding infrared wavebands additional descriptors, such as polymer composition or type can be retrieved for improved classification of plastic litter. Furthermore, remote sensing technologies will be merged with object-based deep learning methodologies to enhance identification of plastic waste items, thus creating a robust learning system. Due to the size and complexity of this problem, automated detection, tracking, characterization and quantification of plastic pollution is a key aspect to improve waste management strategies. We therefore explore multispectral band combinations relevant to the detection of plastic waste and operational approaches in imagery processing. This work will contribute towards algorithm development for analysis of video datasets enhancing future near real-time detection of plastic litter. Eventually, this scientific evidence-based tool can be utilized by stakeholders, policymakers and citizens.