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AUTOMATIC SEAGRASS BANQUETTES DETECTION FROM SURVEILLANCE CAMERA IMAGES WITH DETECTRON2

ABSTRACT: SABATO G., SCARDINO G., KUSHABAHA A., CHIRIVÌ M., LUPARELLI A. & SCICCHITANO G., *Automatic seagrass banquettes detection from surveillance camera images with Detectron2*. (IT ISSN 0391-9838, 2022).

In recent years, machine learning and deep learning methodologies have gained increasing attention in various fields of research, including environmental studies. Some algorithms with deep learning can be used to identify coastal features, detect changes over time, and monitor human activities on the coast, providing important information for sustainable coastal management. This study presents the application of the Detectron2 algorithm for monitoring a beach and verifying the presence or absence of stranded seagrass banquettes from video surveillance system images. The algorithm enables quick and automatic detection of these features, providing a valuable tool for beach managers and researchers alike.

KEY WORDS: Deep Learning, Seagrass, Detection, Beach Monitoring.

RIASSUNTO: SABATO G., SCARDINO G., KUSHABAHA A., CHIRIVÌ M., LUPARELLI A. & SCICCHITANO G., *Rilevamento automatico di banquette di Posidonia con Detectron2 da immagini di telecamere di sorveglianza*. (IT ISSN 0391-9838, 2022).

Negli ultimi anni, metodologie di *machine learning* e di *deep learning* hanno acquisito sempre più attenzione in vari campi di ricerca, compresi gli studi ambientali. Nello specifico, taluni algoritmi di deep learning possono essere utilizzati per identificare alcune caratteristiche delle coste, rilevare i cambiamenti nel tempo e monitorare le attività umane nelle aree di studio, fornendo così informazioni importanti per una gestione sostenibile. Questo studio presenta l'applicazione dell'algoritmo Detectron2 per monitorare una spiaggia e verificare la presenza o l'assenza di banquette di posidonia spiaggiate, il tutto da immagini acquisite da

un sistema di videosorveglianza. L'algoritmo consente una rilevazione rapida e automatica delle banquette, pertanto potrebbe risultare uno strumento prezioso sia per i gestori delle spiagge che per i ricercatori

TERMINI CHIAVE: *Deep Learning*, Posidonia, Rilevamento, Monitoraggio costiero.

INTRODUCTION

In this study we present a deep learning-based system for automatic seagrass banquettes detection that can analyze images from surveillance cameras. This system is capable of quickly and automatically detecting the presence or absence of seagrass banquettes on the analyzed beach, making it a versatile tool for multiple applications.

Posidonia oceanica is a species of marine phanerogam playing an important ecological role in the coastal ecosystem (Cullen-Unsworth & *alii*, 2014), providing habitat and refuge for numerous marine species, protecting the coast from erosion, and contributing to water purification (Waycott & *alii*, 2009).

The stranding of the remains of *P. oceanica* (dead leaves, rhizomes, fibrous remains) is a natural phenomenon that is observed annually on coastlines (fig. 1), especially following autumn and winter storms. The accumulation of stranded biomass, combined with sand, forms structures known as "banquettes" that can reach up to 2 meters in height and stretch for hundreds of meters, depending on the geomorphological setting of the coast (Boudouresque & *alii*, 2012). In general, banquettes are mainly composed of *Posidonia* leaves, whose ribbon-like shape and accumulation method give the mass a very compact and elastic lamellar structure, and in some beach systems also sediments and rhizomes can be important and concur in the composition of banquette (Simeone & *alii*, 2022). However, their elastic nature makes them temporary deposit forms that are easily deformable by the action of incident wave motion. Banquettes, along with their floating fraction, play an important role in the mechanical protection of beaches against erosion (Simeone & De Falco, 2012), hin-

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