

MULTISPECTRAL IMAGING SYSTEM FOR DETECTION OF SMALL VERTEBRATE FOSSILS

DELPUEYO Español, Xana¹; VILASECA Ricart, Meritxell¹;
FURIÓ, Marc³; PUJOL Ramo, Jaume¹

¹ CENTRE FOR SENSORS, INSTRUMENTS AND SYSTEMS DEVELOPMENT (CD6).
TECHNICAL UNIVERSITY OF CATALONIA (UPC). TERRASSA-BARCELONA, SPAIN.

² INSTITUT CATALÀ DE PALEONTOLOGIA MIQUEL CRUSAFONT (ICP), UNIVERSITAT
AUTÒNOMA DE BARCELONA (UAB). CERDANYOLA DEL VALLÈS-BARCELONA, SPAIN.

ABSTRACT

Paleontology is responsible for the study of the evolution of life on Earth, ancient plants and animals, based on the fossil record. One of the main applications of fossils is dating sedimentary layers, which is nowadays made through the detection and posterior identification of tiny dental or skeletal remains of small mammals included in the sediment. Unfortunately, the task of separation of fossils from sediment is done completely manually, which leads to a waste of time with the subsequent significant economic impact. For this reason, this study proposes a new tool based on a multispectral system for the identification of fossil remains of small mammals and reptiles. The system consists of a 12 bit-depth spectral camera (QImaging QICAM Fast 1394) with a Liquid Crystal Tunable Filter (Varispec filter model #VIS-07-HC-20-1012) which allows the recording of the scene through many spectral bands (from 400 nm to 1000 nm with a 10 nm-step). An ultraviolet-blue light source (SpectraLight III overhead luminaire) is used to enhance the contrast between teeth and bones with respect to the sediment, due to their different spectral features in this region of the electromagnetic spectrum. In this work, we present the methodology followed to setup the whole system and to improve its performance, including the protocol followed in order to select the most suitable spectral bands to detect the fossil remains and the algorithms based on image processing developed to locate them. Several examples of remains from different paleontological excavations from Catalonia are presented in this work. The accuracy of the new developed system is compared to current employed techniques. This new and automated system represents a clear innovation in the field of paleontology, and it will be very helpful to overcome limitations of currently used techniques for fossil record dating.