

An integrated multispectral video and environmental monitoring system for the study of coastal processes and the support of beach management operations

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Effective beach management requires environmental assessments that are based on sound science, are cost-effective and are available to beach users and managers in an accessible, timely and transparent manner. The most common problems are: 1) The available field data are scarce and of sub-optimal spatio-temporal resolution and coverage, 2) our understanding of local beach processes needs to be improved in order to accurately model/forecast beach dynamics under a changing climate, and 3) the information provided by coastal scientists/engineers in the form of data, models and scientific interpretation is often too complicated to be of direct use by coastal managers/decision makers.

A multispectral video system has been developed, consisting of one or more video cameras operating in the visible part of the spectrum, a passive near-infrared (NIR) camera, an active NIR camera system, a thermal infrared camera and a spherical video camera, coupled with innovative image processing algorithms and a telemetric system for the monitoring of coastal environmental parameters.

The complete system has the capability to record, process and communicate (in quasi-real time) high frequency information on shoreline position, wave breaking zones, wave run-up, erosion hot spots along the shoreline, nearshore wave height, turbidity, underwater visibility, wind speed and direction, air and sea temperature, solar radiation, UV radiation, relative humidity, barometric pressure and rainfall.

An innovative, remotely-controlled interactive visual monitoring system, based on the spherical video camera (with 360° field of view), combines the video streams from all cameras and can be used by beach managers to monitor (in real time) beach user numbers, flow activities and safety at beaches of high touristic value. The high resolution near infrared cameras permit 24-hour monitoring of beach processes, while the thermal camera provides information on beach sediment temperature and moisture, can detect upwelling in the nearshore zone, and enhances the safety of beach users.

All data can be presented in real- or quasi-real time and are stored for future analysis and training/validation of coastal processes models.

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