APPLICATION OF IMAGE PROCESSING TOOLS ON PHYSICAL MODEL TESTS

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Paper topic: Laboratory and field observations and techniques

1. Introduction

The use of physical modelling is still vital in what concerns to the study of coastal structures, despite the effort to develop theoretical approaches and numerical models to characterize parameters as overtopping, transmission, and reflection (Drei and Lamberti, 1999; Yamashiro *et al.*, 1999; Kriezi *et al.*, 1999; Ilic *et al.*, 1999; Stamos *et al.*, 2001; Besley, 1999; TAW, 2002; EAK, 2002 and the following projets VOWS (2000); OPTICREST (2001); DELOS (2004); CLASH (2005)).

The physical model tests performed to analyze, optimize or study the performance of coastal structures are frequently analyzed visually, in what concerns to stability, including additional wave gauges, to control the wave characteristics and the reflections produced by the structure in analysis.

However, other equipments can be used to enhance or simply improve the results, leading to a more detailed set of results.

This paper describes the use of image processing techniques on physical model tests to characterize the surface flow and the velocity fields near a coastal structure.

2. Experimental setup and image processing tools

The tests were performed at the wave basin of the Hydraulics Laboratory of the Faculty of Engineering of the University of Porto. The wave basin is 28.0 m long, 12.0 m wide and 1.2 m deep. The physical model of the north breakwater of the Leixões port was built at a 1:60 scale according to Froude's law, in a 0.75m channel built inside the wave tank, Figure 1.

The tests were recorded using two video cameras covering multiple plans of the structure, Figure 1.

Two different techniques are described, to analyze the surface flow (Molina *et al.*, 2008) and the velocity fields (Raffel *et al.*, 2007), respectively. The application of both techniques under different wave conditions and for different cross sections is presented.



Figure 1. Physical model and cameras used.

3. Results

As an example, Figure 2 illustrates both surface flow and velocity fields obtained in the vicinity of the detached breakwater. The paper will present and discuss some results of the study, including the velocity profiles in key points of the structure and the comparison between the results from the physical and the numerical models for the hydrodynamic behaviour of the structure.

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(Velocity fields analysis) Figure 2. Examples of surface flow analysis and velocity fields.

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