NEURAL NETWORK PREDICTION OF WAVE OVERTOPPING AT COASTAL STRUCTURES

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The design of coastal structures is highly related to the allowable amount of overtopping. Over the past 20 years extensive research has been done to overtopping, resulting in several prediction formulae for overtopping at coastal structures [*e.g.* Franco *et al.*, 1994 (for vertical walls); van der Meer *et al.*, 1998 (for dikes)]. However these formulae are applicable to a limited range of structure configurations and only give partial predictions. The final goal of this study is therefore to assemble all the existing information about overtopping to give one single design method. This method will be created with the aid of the neural network technique, a technique which is able to recognize patterns in large datasets. This study falls within the scope of the EU project CLASH (www.clash-eu.org) which runs from January 2002 until December 2004.

More than 6500 overtopping tests originating from 132 independent test series were gathered at institutes and universities all over the world. It concerns generic tests as well as site specific tests and this at all kinds of structures. Each of these tests was studied and screened on reliability. After this, each test was put into a database by means of 31 parameters of which 11 hydraulic parameters describing the incident wave climate and 17 structural parameters describing the overtopping section itself. The remaining 3 parameters are general parameters, assigning a unique name to each test and describing the reliability and complexity of the test. More information on this first database can be found in Verhaeghe *et al.*, 2003. Extra model tests and prototype measurements, both performed within the framework of the CLASH-project fill up so-called 'white spots' of the database. This will lead to a final homogeneous database and a final neural network.

Initial training of the neural network is done with the first database. In a first phase 11 of the structural parameters together with 3 hydraulic parameters are used as input. The reliability and complexity of each test is incorporated by one weight factor per test and finally the measured overtopping discharge 'q' is found as output of the neural network. A sensitivity analysis will clarify the relative importance of the input parameters. Training of the neural network with the first database is ongoing at this moment. The final neural network, reproducing a generic prediction method for overtopping at coastal structures will be available halfway 2005.

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References

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