On-Line Generation of 3D-Waves

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ON-LINE GENERATION OF 3D-WAVES

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The paper describes the technique of filtering white noise for on-line generation of 3D-waves on a small PC in the laboratory.

The wave generation package is implemented and tested in the 3D-wave basin at the University of Aalborg.

DESCRIPTION OF THE WAVE TANK

The dimensions of the wave tank are 15.7 x 8.5 meter (see Fig. 1). The water depth during the reported test were 0.7 meter. The paddle system is of the snake-front type with translatory movements (pistons). 10 individually displaced controlled hydraulic pistons give a paddle width of 0.9 m.
Waves are primarily absorbed along the end side of the basin. Because of problems with cross waves also small absorbers are placed along the two side walls.

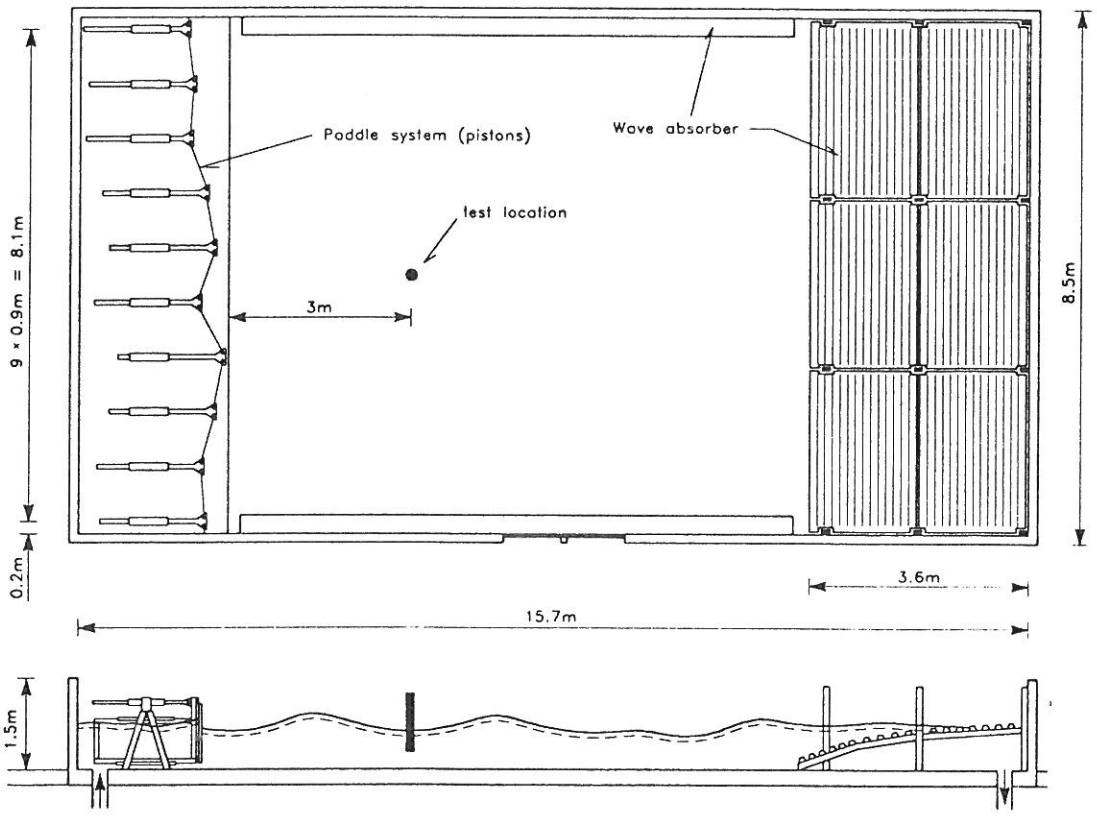

Fig. 1. The 3-D wave tank at University of Aalborg.

TECHNIQUE OF WHITE NOISE FILTER

A Finite Impuls Respons (FIR) filter is created to take an input sequence of "white noise" numbers and then produce a sequence of displacement signals for a wave paddle. Biesel transfer function and mechanical transfer function for the wave paddle are included in the filter.

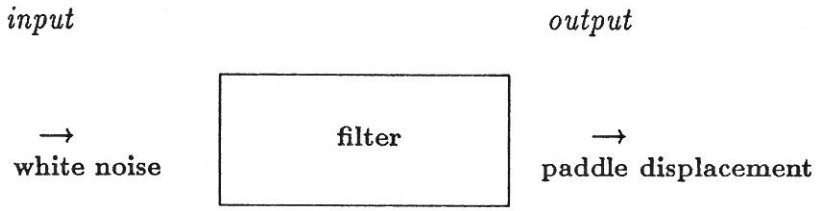

Fig. 2. FIR-filter for generation of 2D-waves.

Modifying the FIR filter by including the 3D-Biesel transfer function and a frequency dependent time delay between the paddle displacements, oblique waves with a specified angle of propagation can be generated.

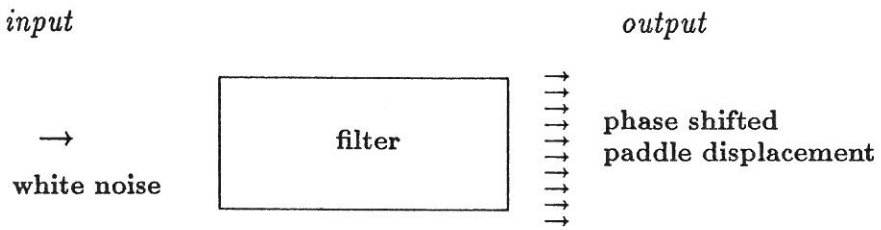

Fig. 3. FIR-filter for generation of oblique 2D-waves.

Now, simply by superimposing a number of filters with different angles of wave propagation, 3D-waves can be generated.

MEASUREMENTS OF WAVES

Waves are measured by a five-gauge array (CERC-type). Analysis of the directional spread $H(f,\theta)$ is performed both by a MLM-method and by a fitting to a cosine $2s$ squared distribution.

TEST RESULTS

Ongoing tests show good agreement between specified directional spreading and measured directional spreading. It is therefore found that on-line generation of any target directional spectrum is possible.

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