

# Using a Time-domain Higher-order Boundary Element Method to Simulate Wave and Current Diffraction from a 3-D Body (PDF)

《船舶与海洋工程学报》 [ISSN:1002-2848/CN:61-1400/f] 期数: 2010年02 页码: 156--162 栏目: 出版日期: 2010-06-25

Title: Using a Time-domain Higher-order Boundary Element Method to Simulate Wave and Current Diffraction from a 3-D Body

作者: 刘 珍; 滕 斌; 宁德志; 孙 亮

Author(s): Zhen Liu<sup>1</sup>; Bin Teng<sup>1\*</sup>; De-zhi Ning<sup>1</sup>; 2 and Liang Sun<sup>1</sup>

1. State Key Laboratory of Coastal and Offshore Engineering, Dalian University of Technology, Dalian 116023, China
2. State Key Laboratory of Ocean Engineering, Shanghai Jiao Tong University, Shanghai 200030, China

关键词: [wave-current diffraction](#); [time-domain simulation](#); [drift force](#); [higher-order boundary element method \(HOBEM\)](#)

分类号: -

DOI: -

文献标识码: A

摘要: To study wave-current actions on 3-D bodies a time-domain numerical model was established using a higher-order boundary element method (HOBEM). By assuming small flow velocities, the velocity potential could be expressed for linear and higher order components by perturbation expansion. A 4th-order Runge-Kutta method was applied for time marching. An artificial damping layer was adopted at the outer zone of the free surface mesh to dissipate scattering waves. Validation of the numerical method was carried out on run-up, wave exciting forces, and mean drift forces for wave-currents acting on a bottom-mounted vertical cylinder. The results were in close agreement with the results of a frequency-domain method and a published time-domain method. The model was then applied to compute wave-current forces and run-up on a Seastar mini tension-leg platform.

## 参考文献/REFERENCES

- Buchmann B, Skourup J, Cheung KF (1998). Run-up on a structure due to second-order waves and current in a numerical wave tank. *Applied Ocean Research*, 20, 297-308.
- Ferrant P (1993). Three-dimensional unsteady wave-body interactions by a Rankine boundary element method. *Ship Technology Research*, 40, 165-175.
- Grue J, Palm E (1985). Wave radiation and wave diffraction from a submerged body in a uniform current. *Journal of Fluid Mechanics*, 151, 257-278.
- Isaacson M, Cheung KF (1992). Wave-current interaction with a large structure. *Proceedings of International Conference on Civil Engineering in Oceans, Texas*. Kim DJ, Kim MH (1997). Wave-Current-Body interaction by a time-domain high-order boundary element method. *International offshore and polar engineering conference, Hawaii*, 25-30.
- Matsui T, Lee SY, Sano K (1991). Hydrodynamic forces on a vertical cylinder in current and waves. *Journal of the Society of Naval Architects of Japan*, 170, 277-287.
- Ning DZ, Teng B (2007). Numerical simulation of fully nonlinear irregular wave tank in three-dimension. *International Journal for Numerical Methods in Fluids*, 53(12), 1847-1862.
- Nossen J, Grue J, Palm E (1991). Wave forces on three dimensional floating bodies with small forward speed. *Journal of Fluid Mechanics*, 227, 135-160.
- Teng B, Easock Taylor R (1993). The effect of corners on diffraction/radiation forces and wave drift damping. *Proceedings*

### 导航/NAVIGATE

[本期目录/Table of Contents](#)

[下一篇/Next Article](#)

[上一篇/Previous Article](#)

### 工具/TOOLS

[引用本文的文章/References](#)

[下载 PDF/Download PDF\(484KB\)](#)

[立即打印本文/Print Now](#)

[推荐给朋友/Recommend](#)

### 统计/STATISTICS

[摘要浏览/Viewed](#) 564

[全文下载/Downloads](#) 460

[评论/Comments](#)



of Offshore Technology Conference, OTC7187, London. Teng B, Eatock Taylor R (1995). Application of a higher order BEM in the calculation of wave run-up on bodies in a weak current. International Journal of Offshore and Polar Engineering, 5, 219-224.

Teng B, Zhao M, Bai W (2001). Wave diffraction in a current over a local shoal. Coastal Engineering, 42, 163-172.

Wu GX, Eatock Taylor R (1987). Hydrodynamic forces on submerged oscillating cylinders at forward speed. Proceedings of the Royal Society of London, Series A, London, 149-170.

Zhao R, Faltinsen OM (1988). Interaction between waves and current on a two-dimensional body in the free surface. Applied Ocean Research, 10(2), 87-99.

---

备注/Memo: -

---

更新日期/Last Update: 2010-06-01