22nd International Workshop on Water Waves and Floating Bodies

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Editors:
Šime Malenica and Ivo Senjanović

22nd International Workshop on Water Waves and Floating Bodies

Questions & Answers

Editors:
Šime Malenica and Ivo Senjanović

Bennetts L.G., Biggs N.R.T. and Porter D.

Wave scattering by a circular ice floe of variable thickness

Number of questions: 2

Question No 1 by: Sturova I.V.

Did you compare your results with the shallow water solution (without evanescent waves)?

Answer

No comparison to results from `shallow water theory' has been made with this method. However, extensive investigations have been made with the single-mode approximation (i.e. no evanescent waves), particularly in regard to near resonances (please see my PhD thesis Chap 10). I believe that for shallow water depths results produced by the SMA would be almost identical to SWT.

Question No 2 by: Sturova I.V.

Did you determine the scattering diagram for surface waves? The scattering diagram allows to determining the energy of scattering surface waves. This energy should correlate with the maximal displacements of the floe.

Answer

Although my primary interest is in the displacement of the floe itself, the free-surface profile is readily available. In my thesis I do look at this quantity and in particular I plot the amplitude of the most slowly decaying scattered wave (see figs 9.6-9.7 and 10.6-10.11).

Bhattacharjee J., Karmakar D., and Sahoo T.

On transformation of flexural gravity waves

Number of questions: **1**

Question No 1 by: Korobkin A.A.

Could you, please, explain the continuity conditions at the point on the floating elastic plate, where the elastic characteristics of the plate change by jump?

Answer

Yes, there is a jump in the elastic characteristics from region 1 to region 2. The continuity conditions for the bending moment and shear force at the point on the floating elastic plate will contain the jump in the elastic characteristics of the plate.

Bingham H.B., Engsig-Karup A. P. and Lindberg O.

A high-order finite difference method for nonlinear wave-structure interaction

Number of questions: **1**

Question No 1 by: Dingemans M.W.

Harry, I think you did not show the wave profile at 15.7m. This is the most discriminating me.

Answer

?

Blenkinsopp C.E. and Chaplin J.R.

Validity of small-scale physical models involving breaking waves

Number of questions: 0

Bredmose H., Peregrine D.H. and Hunt A.

Wave height ? A study of the impact of wave groups on a coastal structure

Number of questions: 3

Question No 1 by: Dingemans M.W.

Henrik, another application could be to determine how the damage to the wall diminisher when the length of the upper shelf is increased when that is about ¾ wave length. The initial wave breaking has already occured

Answer

Yes, the length of the upper shelf has an important effect on the impact for a given wave and a sufficiently long shelf will cause the wave to break before impact. - A real optimisation of this would include some considerations on the cost of constructing a wider shelf.

Question No 2 by: Korobkin A.A.

How do you distinguish violent impact cases ? Did you calculate loads acting on the vertical wall ?

Answer

We use "violent" for impacts associated with accelerations at impact much greater than O(g). This is the same as having local pressure gradients much greater than that of hydrostatic pressure. Loads on the wall can be calculated from the pressure field. This field can be evaluated as post processsing in our model. Exanples of such loads can be seen in e.g. Peregrine et al 2004 and also Peregrine 2003.

References:

D.H. Peregrine 2003 "Water wave impact on walls", Annual Review of Fluid MechanicsvVol. 35: pp 23-43.

D.H. Peregrine, H. Bredmose, G. Bullock, C. Obhrai, G. Müller and G. Wolters (2004).'Violent water wave impacts on walls and the role of air'. 29th Int. Conf. Coast. Engng. Lisbon. ASCE.

Question No 3 by: Newman J.N.

How do you use the Schwarz Christoffel transformation with a nonlinear free surface elevation ? It seems that adding discretization points on your relatively small sloping would be easier than using the S-C transformation ?

Answer

We considered that but went for the SC option since conformal transformation is already built in for various generic bed shapes (eg. Semi-circular hump, scmi elliptical hump etc) The algorithm has a computational expense of $0(N^2)$. Hence in the general case, it is cheaper to deal with bottom variations through conformal mapping rather than by adding points. For the present case where the deviation from flat bed occupies just a small fraction of the domain, I agree that adding points might be attractive.

Breslin J.P.

Prediction of planing forces on prismatic hulls far exceeding expectations by inconsistent theory

Number of questions: 0

Casetta L. and Pesce C.P.

Hamilton's principle for dissipative systems and Wagner's problem

Number of questions: 0

Chaplin J.R., Farley F.J.M. and Rainey R.C.T

Power conversion in the Anaconda WEC

Number of questions: 0

Chatjigeorgiou I.K. and Mavrakos S.A.

A semi-analytical formulation for the wave-current interaction problem with a vertical bottom-seated cylinder including square velocity terms

Number of questions: **0**

Chen X.B. and Duan W.Y.

Formulations of low-frequency QTF by $O(\Delta\omega)$ approximation

Number of questions: 0

Chung J.Y., Nahm J.O., Kang H.D. and Kwon S.H.

A novel experimental technique in Slamming

Number of questions: 0

Colicchio G., Greco M. and Faltinsen O.M.

Influence of gaseous cavities in ship-hydrodynamic problems : a simplified study

Number of questions: **4**

Question No 1 by: Khabakhpasheva T.I.

Is it possible to use the approach of air bubbles and incompressible fluid in your case? In case of jet impact or water impact, considered here, the pressure changes fast from + 10 to -10 atmosphere. Here, the presence of air bubbles in the fluid is of great importance.

Answer

In the experiment of water on deck, the comparison between numerical and experimental data has shown that the compressibility plays an important role in the dynamic and kinematic of the bubble, even though the amplitude of pressure oscillations is much smaller than +10- -10 atmosphere. It is feasible to assume that in case of such large oscillations, the compressibility effects cannot be neglected.

Question No 2 by: Dingemans M.W.

The slamming on the deck reminds of wave forces due to breaking waves on dikes. In those situations also a cylindrical type of air pocket is included; upon impact this air pocket oscillates and forces oscillations in the pressure

Answer

The water on deck problem is not completely similar to the interaction of a breaking waves with dike. In the case of the dike, the trapped bubbles continue to interact with the impacting waves, in our case this is not true and the interaction of the bubble with the free surface is more limited.

Question No 3 by: Dingemans M.W.

How do you do the data analysis ? Here you do need Walsh and Hear functions, Fourier is not suited here.

Answer

This implies the presence of a bubble whose oscillation is more uniform in time. This would allow the use of a Fourier analysis of the data, even though we have not carried out this analysis.

Question No 4 by: Thiagarajan K.

Where is the leading edge of the cavity located in the water-on-deck experiments ? Why is there a discrepancy with computations ?

Answer

In the experiments, the water leaves the bow front tangentially, plunges on the deck and eventually forms the cavity. So the leading edge of the cavity is located at the deck edge. In the simulations, there are two main reasons why the leading edge is not exactly there and moves slowly far from the edge: 1) the body is described by a level-set function which smoothes the sharp corner, the related error is comparable to the one associated with the used grid size, 2) the level-set function used to describe the air-water interface needs to be re-initialized in time and this causes additional smoothing locally.

Delhommeau G., Noblesse F. and Guilbaud M.

Simple analytical approximation to a ship bow wave

Number of questions: 1

Question No 1 by: Bingham H.

Could you explain why your boundary between stable and unstable plan still exists at zero speed ?

Answer

The zero speed line is a singular line. The limit of unsteadiness exists at a very small speed, but obviously not at exactly zero speed.

De S., and Mandal B.N

Water wave scattering by two partially immersed barriers – an alternative method of solution

Number of questions: **0**

Diebold L

Study of the Neumann-Kelvin problem for one hemisphere

Number of questions: 0

Doctors L. J

A test of linearity in the generation of ship waves

Number of questions: 1

Question No 1 by: Chen X.B.

How much is the effect of surface tension and surface elasticity? May we expect large effects for small models and in the low-speed range?

Answer

I would like to thank Dr Chen for his interesting question. I have studied the matter of surface tension and surface elasticity in papers that I presented at the eighteenth and nineteenth Workshops. The calculations were performed with and without the incorporation of these two physical properties.

For the small ship model that I tested, which had a length of 1.5 m, the effect of viscosity was significant only at Froude numbers less than about 0.3. Its influence was to reduce the predicted wave elevations and provide better agreement with the experimental measurements. The influence of surface elasticity was somewhat less, being to slightly reduce the wave generation at low Froude numbers.

References:

Doctors, L.J.: "The Influence of Viscosity on the Wavemaking of a Model Catamaran", *Proc. Eighteenth International Workshop on Water Waves and Floating Bodies (18 IWWWFB),* Le Croisic, France, pp 12-1-12-4 (April 2003)

Doctors, L.J. and Zilman, G.: "The Influence of Surface Tension and Viscosity on the Wavemaking of a Model Catamaran", *Proc. Nineteenth International Workshop on Water Waves and Floating Bodies (19 IWWWFB),* Cortona, Italy, pp 11.1-11.4 (March 2004)

Duan W.Y. and Dai Y.S

Integration of the Time-Domain Green function

Number of questions: **2**

Question No 1 by: Clement A.H.

Your calculations features a H function differs from the Green function by incorporating a J1 Bessel function instead of J0 in the usual G.F. So could you please tell us the numerical method you use to compute this H modified Green function in your calculations ?

Answer

In the derived line integration, apart from a new Green function G, which can be calculated by the usual manner for G. For the corresponding new function H, we use the ordinary differential equation which link H and the derivative with respect to R of G.

Question No 2 by: Noblesse F.

This is a very interesting and useful work. Do the modified time and space integration methods you use essentially correspond to integration by parts ?

Answer

If we use integration by parts for time integration, we got the results which is different from the present, that will not give stable results. The space integration actually used the integration by parts.

Ducrozet G., Bonnefoy F., Le Touzé D. and Ferrant P.

Investigation of freak waves in large scale 3D Higher-Order spectral simulations

Number of questions: 1

Question No 1 by: Rainey R.

This is a very interesting piece of work on what is a very important problem industrially - 100 rigs were lost in the Gulf of Mexico in 2005, because the extreme waves were under-estimated. My own view, in my paper at the Newman honorary volume of J.Eng.Maths (see http://oe.mit.edu/flowlab/NewmanBook/Rainey.pdf) is that freak waves are essentially a strongly-nonlinear phenomenon, which explains why they have not been found in weakly-nonlinear simulations (e.g. the paper by Socquet-Juglard et. al. in JFM vol 542). Your simulations should in principle pick up strongly non-linear effects, if I understand you right - but only if the spectral resolution is sufficiently fine. I wonder if it is? In my paper just mentioned I give the example of a freak wave of crest elevation 2.35 times the significant wave height, measured recently in the North Sea by Stansell. This is much higher than anything you have found. The implication of freak waves being strongly nonlinear is that they should be relatively easy to reproduce experimentally. You just need a tank with a very good beach, and then run the wave maker for very long periods. There is no need to have a very long tank, to allow weakly-nonlinear effects (such as the Benjamin-Feir instability) to build up. Do you have a tank with a sufficiently good beach at ECN? If so, can you do the experiment I propose? If the tank is very long too, so much the better - if the weakly-nonlinear effects are important, the results should change with distance from the wave maker.

Answer

?

Eatock Taylor R. and Meylan M.H

Theory of scattering frequencies applied to near-trapping by cylinders

Number of questions: 0

Elkin J.D. and Yeung R.W.

Sway and roll hydrodynamics of twin rectangular cylinders

Number of questions: 0

Evans D.V. and Porter R.

Examples of motion trapped modes in two and three dimensions

Number of questions: 0

Fitzgerald C.J. and McIver P.

Approximating near-resonant wave motion using a mechanical oscillator model

Number of questions: 3

Question No 1 by: Newman J.N.

Ursell showed in ~ 1964 that there is a fundamental difference between the long-time response of the free-surface problem and a simple damped oscillator, namely the former has only a finite number of oscillations. How does this difference affect your results?

Answer

In the limit of long-time, the oscillations in a infinite depth fluid will be finite and the decay becomes algebraic as shown by Ursell. However, Ursell mentioned that this type of decay only occurs at extremely small oscillation amplitudes after a large time has passed. In our case, we are interested only in medium-large oscillation amplitudes caused by the interaction of the incident and resonant wave modes during the initial transient and medium-term stages of the response. Therefore, the negligibly small residual oscillations that will occur in the damped harmonic oscillator method at asymptotically large time, while not describing the situation correctly, are not of great concern in this approximation.

Question No 2 by: Clement A.H.

A comment after N. Newman's comment. The same phenomenon finite number of oscillations applies for the time-domain Green function, and I have shown in a paper in Journal of Engineering Math. (1998) that this function is the solution of an ordinary differential equation of the time variable featuring non-constant coefficients, (coefficients are polynomial of t), Maybe you should consider our oscillation with time varying coefficients ?

Answer

To describe the resonant mode well, we need to generate a term of the form $\exp(-\varepsilon\ t)\ \exp(i\ \omega_0\ t)$ from the equation (1) in the abstract. In the constant coefficient case, the homogeneous solution will have the form $\exp(-\varepsilon\ t)\ \exp(i\ [(\omega_0)^2-\varepsilon]^{1/2})$ which for small ε (as assumed in the method) is very close to the desired form. It is important, therefore, to maintain this term in solution if we want to describe the beating pattern due to the combination of the incident and resonance terms. By introducing time-varying coefficients, (in the differential equation) it may not be possible to model the beat-pattern as effectively. Furthermore, the simple method may be considerably complicated by time-varying coefficients. Although this does not directly address your question regarding the finite number of oscillations, describing the time-dependent response was (for our research) of primary concern.

Question No 3 by: Meylan M.

Have you considered using the Fourier transform to calculate the solve in time domain (i.e. as your analytic solution for $\eta(x,t)$) *?*

Answer

The analytic solution for $\eta(x,t)$ that I mentioned was for the structure-free wave propagation problem so it should be possible to compute this using a scheme describes by Eatock Taylor in lost years workshop involving an FFT (other methods may also exist). The aim was to approximate the response between the structural elements resulting from wave-incidence using the damped harmonic oscillator equation with minimal computations. It was also proposed that the frequency domain solution near the resonant frequency (in order to determine the added mass and damping and hence the resonant frequency and decay constant) be computed, along with the incident waveform in the absence of the structure (despite the large approximation inherent in the method). Thus, in the DHO equation, the forcing term would be the incident wave signal in the absence of the structure. Thus, the time-domain evolution of the free-surface elevation between the structures was approximated. The Fourier transform method you have suggested would compute the solution exactly but would not be as quick to implement and require a significant departure from the numerical approach adopted here.

Forestier J.M.

Evolution equation of a potential flow with a free surface and moving solid boundaries

Number of questions: **1**

Question No 1 by: Bingham H.

You seem to have written the fre-surface conditions in Lagrangian forms and added the time derivatives of Φ & M as unknowns, together with their evolution equations. What is the advantage of this ?

Answer

?

Gazzola T.

A shape optimisation technique for the Wagner problem

Number of questions: **0**

Gilloteaux J.C., Ducrozet G., Babarit A. and Clément A.H.

Non-linear model to simulate large amplitude motions : application to wave energy conversion

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Number of questions: **1**

Question No 1 by: Bingham H.

Do you have any idea of how much reflected wave energy existed in the physical experiments that you showed ? He I'm thinking both of end wall reflections of the incident wave and scattered waves from the structure re-reflected by the side walls.

Answer

There is a damping beach on the end wall which works rather well, so we energy reflected from the end wall is very low. From the side wall, it could an issue, but we don't have any precise idea. What we observed in the tank is that the reflected waves from the side walls were also very small in comparison with the incident wave.

Question No 2 by: Rainey R..

This is a beautiful, thorough, piece of work at ECN on this class of WEC - and very welcome to the wave energy community. It is gradually becoming apparent what the pros and cons are of the various types of WEC. With your device, the power-to-weight ratio is not as good as the raft type (e.g.Pelamis) - is that right? But the structure may be cheaper because it is not working as hard - is that right? A key measure of how hard the structure is working is the angular motion at the power-take-off. Large angles and small torques are easier structurally than vice-versa.

Answer

If I understand the background of your question, you are looking for some général rules and/or typical simple indicators based on physics to assess the economical viability of wave energy devices. Indeed the power-to-weight ratio could be one of such indicators, but you should be very carefull when defining power and weight for each device; their definition varies from one WEC to the other. Power for example must be accounted as annual energy delivered divided by 8766 (number of hours/years) if you want to compare devices embarking some energy storage component (PELAMIS, SEAREV, WAVE_DRAGON, ..) giving a smoothing effect, to devices without energy storage where the generator must follow and capture the peaks of the instantaneous power like AWS featuring a 2MW direct drive generator installed. The same prudence must be applied when defining the weight, depending on the principle of the system which determines if this weight is active or passive, only structural or playing a role in the energy production. In our device where a massive wheel plays the role of an internal pendulum, we use gravity as the reference and then we need this weight for the system to work efficiently. We will not try to avoid it, because lighter would mean less power here, but rather to use cheap heavy materials (concrete, stones, bulk minerals,..) where possible. This remark is just to show how difficult it is to find simply defined criterions to compare systems so different in their principle. Even on you proposal of considering angles and torques you should avoid giving a too simple rule which can be used blindly by people not aware of the real "philosophy" of each system. It is difficult for example to compare PELAMIS which is a "wave profiler", to SEAREV which is a resonant system. In the first case the system is design to follow more or less the slope of free surface and then the angles will remain moderate. In the second case, we seek to amplify (by active real time control) the motion of the pendulum as much as possible, even beyond the half turn point (Pi); this limit case is precisely one of the motivations of the choice of a wheel as a pendulum. In the first case (limited angular stroke) the design will be driven by the maximum constraints reached when the system hit its end stop, while in the second case, there is no end stop and the wheel can make a full revolution (in extreme conditions) without any damage. This is to illustrate that the question of structural design (then sizing, then costing) is not necessarily linked to the normal mode of operation (thus to the working principle of the system), but often to limit cases, and because survivability is the number one criterion in this matter, the choice of a WEC principle must integrate this criterion at this premium rank. This is the expression of our challenge: the cost of the machines is driven by survivability in extreme conditions, while they are paid by their production in moderate seas (most of the time). Wave energy machines depends on so many parameters that one should avoid considering only a few typical key ratio to characterize them, with the risk of disqualifying good projects looking "exotic" at first glance.

Greaves D.

Numerical simulation of breaking waves and wave loading on a submerged cylinder

Number of questions: 0

Grue J.

Nonlinear wave-body interaction by a formulation in spectral space

Number of questions: 3

Question No 1 by: Bredmose H.

How does the inclusion of the body affect the numerical work effort needed to solve the model ?

Answer

The main complication is the FFT representation of free surface outside the cylinder. We need to perform the integration with a hole in the free surface.

Question No 2 by: Bredmose H.

Would the approach allow for more than one cylinder in the domain and would there in this case be a restriction on the distance between the cylinders ?

Answer

The formulation is exact. Any number of cylinders can be included in the integral , which then will be changed. There is no restriction on the distance between the cylinders.

Question No 3 by: Bingham H.

For use as an outer boundary to more resolved models would it not be easier to work with a square or rectangular body ?

Answer

Yes, this is a good point, and is worthwhile to look at.

Harter R., Abrahams I.D. and Simon M.J.

The effect of surface tension on trapped modes in water wave problems

Number of questions: 0

Iafrati A. and Korobkin A.A.

Numerical analysis of initial stage of plate impact on water surface

Number of questions: 0

Kashiwagi M.

Reciprocity relations of waves generated by an antisymmetric floating body

Number of questions: 3

Question No 1 by: Evans D.

It is not clear from you proof that the result applies for example to a Lewis form when the potential is expressed as a linear combination of the incident wave and all three possible 2 dimensional degrees of freedom.

Answer

In the expression of the radiation potentials, the summation sign with respect to the mode index (j) is deleted with the convention that any term of an equation containing the same index twice should be summed over that index. Namely $X_j P_j$ means $\sum_j X_j P_j$. Therefore there is no restriction in the proof concerning the number of modes of the body motion.

Question No 2 by: Korobkin A.A.

It looks like your result for transmission coefficients in the case of asymmetric 2D body is valid also for moored body with linear restoring force. Is this correct?

Answer

You are correct. The linear restoring force can be determined irrespective of the unsteady velocity potential, and the restoring force coefficient is a real quantity. Thus the proof for the reciprocity relation can be the same even if a moored body with linear restoring force is considered.

Question No 3 by: Newman J.N.

One case where your relations might not hold, in the context of moorings is if the mooring force includes damping. Perhaps the Salter 'duck' is a good starting point to minimize the transmission coefficient?

Answer

Thank you for your comment. I am going to develop an asymmetric floating body which is efficient as a floating breakwater. It may be interesting to perform numerical computations for the Salter duck to see the relative performance.

Khabakhpasheva T.I. and Wu G.X.

Coupled compressible and incompressible approach for jet impact onto elastic plate

Number of questions: 4

Question No 1 by: Bredmose H.

The maximum deflection does not depend on the jet position. It depends on the width. This is in the line with the impulse of the jets, not dependent on position but surely dependent of width. Would such simple reasoning explain your observations?

Answer

Of course, the jet width is more important than jet position because the jet load has impulsive nature. But the time instant, where the maxima strain and deflections are achieved, depends on both jet position and jet width. And if we are interested in the distribution of the strain or deflection, we have to perform calculations with exact data. Results obtained for the case, when the jet width is equal of the plate length may be used in approximation of maxima only.

Question No 2 by: Thompson I.

Regarding the first bullet point in section 5 : Is the weak dependence on jet position due to the choice of boundary conditions on the plate edges ?

Answer

In my opinion, of course, boundary conditions on the plate edges have great influence on the plate vibrations. But here I considered the case of simply supported plate only.

Question No 3 by: Yeung R.W.

From your presentation, it appears to suggest the compressible model is more accurate except it is more difficult to solve. The switch to incompressible model appears desirable. So, rather than choose your to take 1 or 2 arbitrarily, would be more appropriate to have a measure of to be criterion of switching ?

Answer

I try to find the criterion of switching, but I can not indicate it now. After my calculations, I can say that time, during which rarefaction wave passes through the jet width twice, is quite suitable for switching.

Question No 4 by: Bredmose H.

The maximum deflection does not depend on the jet position. It depends on the width. This is in the line with the impulse of the jets, not dependent on position but surely dependent of width. Would such simple reasoning explain your observations ?

Answer

Of course, the width of the jet is more important than jet position because impulse load of jet. But the phase where the maxima strain and deflections are archived depend of both jet position and jet width. And if we are interesting, the strain distribution or deflection distribution, we need doing calculations with exactly dates. Results for the case, when width of the jet is equal of the length of the plate is suitable for approximation of maximas only.

Klopman G., Dingemans M. W. and van Groesen B.

Propagation of wave groups over bathymetry using a variational Boussinesq model

Number of questions: 0

Korobkin A. and Malenica Š.

Steep wave impact onto elastic wall

Number of questions: 0

Malenica Š., Senjanović I., Tomašević S. and Stumpf E

Some aspects of hydroelastic issues in the design of ultra large container ships

Number of questions: **1**

Question No 1 by: Eatock Taylor R.

The springing comparisons in your presentation are most interesting, and remind me of a distinction we tried to make when working on springing at University College London during the early 1970s [1]. This is the distinction between large responses due to ship-wave matching (at critical values of L/λ), and those due to resonance at the encounter frequency. One can anticipate a linear component of resonant response which is strongly influenced by structural damping. How did you identify the resonant frequencies of the (wet) vertical modes, and what are the implications as to the frequency ranges over which assumptions about structural damping might affect the comparison between theory and experiment?

References:

Bishop, R.E.D. and Eatock Taylor, R. (1973) On wave induced stress in a ship executing symmetric motions. Phil. Trans. R. Soc. Lond A., 275, 1-32.

Answer

The so called ship wave matching in the present context, is likely to be more relevant for quasi static type of structural responses because the associated wave length (for vertical bending) is rather large i.e. of the order of the ship length. This means that we are quite far from the resonance of the first wet bending mode. As for the wet mode frequencies they are calculated by solving the eigenvalue problem for Equation (3). The influence of damping is quite a large around the resonance and the maximum springing response is mainly driven by the damping. The important frequency range for springing is quite limited around the natural frequency and is usually very narrow. The evaluation of the correct value of damping which should be put in the model is a very difficult task and usually empirical values are used or the values directly obtained from full scale measurements.

Malleron N., Scolan Y.-M. and Korobkin A.A.

Some aspects of a generalized Wagner model

Number of questions: 0

Miloh T.

Structural acoustics of a floating circular elastic plate

Number of questions: **1**

Question No 1 by: Korobkin A.A.

You solved the scattering problem for rigid floating plate in frequency domain. Do you think your solution can be used to find the solution in time domain for a given pressure pulse?

Answer

Yes, it can if a Fourier transform is used in time. Thus the sound field response to the various Fourier modes of the given pulse can then be summed up. A more economical (computationally) method is to simulate the sound field response in time, while paying care to numerical instability and temporal accuracy. The pulse can be modelled using a Gaussian profile in order to achieve convergence in time accuracy.

Molin B., Kimmoun O. and Remy F.

Non-linear standing wave effects on the weather side of a wall with a narrow gap

Number of questions: **1**

Question No 1 by: Kwon S.H.

The integral equation you solved is a Fredholm integral equation of first kind. Then the operator is compact. If you discretize it, the matrix can be ill-conditioned. Did you find any difficulty in the numerical solution?

Answer

In the calculations we divide the interval [0 pi/2] in 50 or 100 elements. We did not observe any numerical accuracy problem, probably because of the small size of the linear system.

Nabergoj R. and Prpić-Oršić J.

A comparison of different methods for added resistance prediction

Number of questions: 1

Question No 1 by: Doctors L.J.

Can you kindly clarify the differences in the added-resistance theories that you used. We can observe that these theories disagree amongst themselves as much as they do with the experiments.

Answer

This question goes back to the origins of this paper, which was motivated by the unsatisfactory comparison of theory with added resistance experiment for the case of a modern RO-RO ship. The attempt of improving predictions by using different theoretical methods has clearly shown the drawback of existing analytical tools and, moreover, the large discrepancies between the numerical results. The added resistance theories here considered are the most popular ones and in the references one can find the original papers for major details. This paper, showing the experiments, clearly demonstrates that the theoretical methods for predicting added resistance are still unsatisfactory for design application and in particular at preliminary stage of design. The aim is to stress this unreliability for modern ship forms and to start a new discussion between researchers. In the last decade no substantial evolution of the existing theories can be noticed and, according to our opinion, the problem should be reconsidered again.

Nam B-W. and Kim Y.

Effects of sloshing on the motion response of LNG-FPSO in waves

Number of questions: 0

Newman J.N.

Trapping structures with linear mooring forces

Number of questions: 1

Question No 1 by: Bingham H.

You said that both the stiffness k $\rightarrow \pm \infty$ limits give the fixed body problem. It seems to me that there should be a physical limit to your negative k range corresponding to the stiffness which pushes your body out of the water.

Answer

My interpretation of $k < 0$ is to replace this by a positive inertial restraint, say $k = \Omega^2 m'$. An example, for a heaving body, would be a balanced “see-saw” with two masses above the free surface. As $m' \rightarrow \pm \infty$ the heave response to a finite exciting force tends to zero. This physical argument may be somewhat heuristic. However the interior closed streamlines in Figure 1 which surround the singular point $x = \pi/2$ are apparently similar to McIver’s fixed structures, for both k = 6.52 and k = - 5.32, and this supports my heuristic argument

Noblesse F., Yang C. and Espinosa R.

Nearfield and farfield boundary-integral representations of free-surface flows

Number of questions: **1**

Question No 1 by: Doctors L.J.

Thank you for your interesting representations as well as the question of the difference between the various theories for the wave resistance, there is also the question of the reliability of the so-called experimental wave resistance. Was this obtained, for example, by subtracting the estimated frictional resistance from the measured total resistance?

Answer

We agree that experimental determination of the wave resistance of a ship involves uncertainties. We believe that the wave resistance of the Wigley hull and the Series 60 model, which are slender hulls for which the form factor is small, was determined by subtracting the ITTC friction drag from the measure total drag, as you mention.

Pinkster J.A. and Hermans A.J.

A rotating wing for the generation of energy from waves

Number of questions: 0

Pistani F. and Thiagarajan K.

Experimental campaign on a moored FPSO in complex bi-directional sea states

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Number of questions: **0**

Qiu W. and Peng H.

Numerical solution of body-exact problem in the Time Domain with a panel-free method

Number of questions: **2**

Question No 1 by: Newman J.N.

In general, when the waterline is trimmed, you may have a case where the waterline intersects two adjacent sides of the rectangle in parametric space. How do you deal with this case ?

Answer

In this case, the rectangle in the parametric space is divided into two domains in the *u*-direction.

Question No 2 by: Ferrant P.

I would like to mention the availability of a large data set in the case of a hearing sphere in body-non linear formulation, published by myself in the 18th ONR symposium on Naval Hydrodynamics, Am Arbor, 1990. Harmonic components of the force, radiated waves are documented for a large variety of waves numbers and amplitudes, with very large non linear effects in some cases. These results are validated by comparisons with experiments and might be of interest for comparison with the model you are developing

Answer

Thank you for providing the reference. We will use those data to validate our numerical method in future studies.

Scolan Y.M., Kimmoun O., Branger H. and Remy F.

Nonlinear free surface motions close to a vertical wall. Influence of a local varying bathymetry

Number of questions: **0**

Sturova I.V.

Time-dependent hydroelastic response of an elastic plate floating on shallow water of variable depth

Number of questions: **1**

Question No 1 by: Meylan M.

Can you solve the free problem with your method ?

Answer

Yes, these results will be published in Journal of Applied Mathematics and Mechanics (into Russian) in 2008.

Sun H. and Faltinsen O.M.

Hydrodynamic forces on a planing hull in forced heave or pitch motions in calm water

Number of questions: 0

Taylor P.H., Zang J., Walker A.G. and Eatock Taylor R.

Second order near-trapping for multi-column structures and near-flat QTFS

Number of questions: 0

Thompson I., Linton C. M. and Porter R.

A new approximation method for scattering by large arrays

Number of questions: **0**

Tuitman J. and van Aanhold H.

Using generalized modes for time domain seakeeping calculations

Number of questions: 2

Question No 1 by: Newman J.N.

Are you solving the 'body nonlinear problem', i.e. the rigid-body modes are finite ?

Answer

The problem is solved partly non-linear. The linear added mass, damping and diffraction are pre-calculated in a linear frequency domain analyses. The Froude-Kriloff, hydrostatics and slamming forces are non-linear. We account for large amplitudes of the rigid body bodes where as the deflection of the flexible modes is assumed to be small.

Question No 2 by: Doctors L.J.

Are you able to include structural damping into your vessel-deflection analysis? If so, would this damping be linear?

Answer

Although my primary interest is in the displacement of the floe itself, the free-surface profile is readily available. In my thesis I do look at this quantity and in particular I plot the amplitude of the most slowly decaying scattered wave (see figs 9.6-9.7 and 10.6-10.11).

Vanden-Broeck J.-M., Parau E. and Cooker M.

Three-dimensional capillary-gravity waves generated by moving disturbances

Number of questions: **0**

Zang J., Ning D., Liang Q., Taylor P.H., Borthwick A.G.L. and Eatock Taylor R.

Modelling wave-coastal structure interactions using a Cartesian cut cell method

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Number of questions: **0**