



Alistair Borthwick
Chairman, Editorial Advisory
Panel

Editorial

A. G. L. Borthwick CEng, PhD, DSc, FICE

Although the world is in grip of the worst recession for more than 50 years, there remain many opportunities for advances in civil engineering, in particular the construction of new infrastructure, enhanced energy supply systems, improved resource engineering (including water supply, waste management, and food production technologies). This issue of *Engineering and Computational Mechanics* presents advances in our understanding of flood waves, pedestrian flows, the behaviour of composite beams in fires, and the stability of thin-walled structures.

The first paper by Tan and Chu¹ describes a Lagrangian block method for simulating flood inundation over dry land. Block-like liquid elements are used to represent the flow. The contact problem at the wet-dry front is investigated, with care taken to include the influence of bed friction on the front velocity. Useful results are presented for a standard dam break problem representative of the sudden failure of a concrete dam, the overtopping of a river bank and inundation of the floodplain, and outflow from a sump. In all cases, friction is found to be a dominant factor in determining the speed of the front. In keeping with the theme of fluid motion, the second paper by Huang *et al.*² considers the flow of people using a conservation law approach that incorporates certain aspects of pedestrian route choice behaviour. The use of fluid kinematics for modelling non-fluid motions is well-established in other areas, such as the shock-like behaviour of traffic as cars enter bottlenecks analogous to the flow of a compressible fluid through a Laval nozzle (Lighthill and Whitham³). Huang *et al.* allow their idealised pedestrians to have two directions of movement, including reaction to what is visible ahead. Pedestrian density is selected as the conserved variable. The methodology is illustrated using a demonstration case study of pedestrian movement on a crowded railway platform. The model has plenty of potential applications including crowd movements at leisure events, religious processions, political demonstrations, and shopping centres.

The second half of the issue takes a structural form, starting with a paper by Luu and Bradford⁴ on the thermo-elastic restrained buckling of a steel joist in a composite beam. This subject is of great practical importance regarding the integrity of steel framed structures in a fire. As buckling occurs, the joist cross-

section undergoes distortion, which is modelled using a stiffness approach. Luu and Bradford's model provides an estimate of the critical temperature at which buckling failure occurs. For a steel-frame structure containing a localised fire, the cooler structural members can bring forward the onset of thermo-elastic buckling. The paper contains a parameter study looking at the effects of slenderness ratio, twist restraint against buckling, web slenderness, and thermal gradient on the steel joists of composite beams at high temperature. In the final paper, Ribeiro⁵ examines the stability of Duffing oscillators, which represent non-linear multi-degree of freedom systems such as arise when modelling thin-walled structures such as beams and plates. Three analysis techniques are compared: a harmonic balance method and eigenvalue problem; the determinant of the system Jacobian matrix; and a perturbation technique. Ribeiro compares the merits and drawbacks of the different techniques for two example applications: plane bending of a beam clamped at both ends, and bending of a fully clamped plate. Issue two of *Engineering and Computational Mechanics* concludes with a book review by Owen of 'W. T. Koiter's Elastic Stability of Solids and Structures' edited by van der Heijden⁶.

To enable *Engineering and Computational Mechanics* to go from strength to strength, the editorial panel would very much like to encourage readers to submit articles on the innovative application of mechanics in civil engineering practice.

REFERENCES

1. TAN L. W. and CHU V. H. Simulation of wave fronts on dry beds using Lagrangian blocks. *Proceedings of the Institution of Civil Engineers, Engineering and Computational Mechanics*, 2009, 162, No. 2, 57–66.
2. HUANG L., XIA Y., WONG S. C., SHU C.-W., ZHANG M. and LAM H. K. A dynamic continuum model for bi-directional pedestrian flows. *Proceedings of the Institution of Civil Engineers, Engineering and Computational Mechanics*, 2009, 162, No. 2, 67–75.
3. LIGHTHILL M. J. and WHITHAM G. B. On kinematic waves. II. A theory of traffic flow on long crowded roads. *Proceedings of the Royal Society of London*, 1955, A229(1178), 317–345.
4. LUU T. K. and BRADFORD M. A. Thermoelastic restrained buckling of composite beams. *Proceedings of the Institution*

of Civil Engineers, Engineering and Computational Mechanics, 2009, 162, No. 2, 77–86.

5. RIBEIRO P. Stability of multi-degree-of-freedom Duffing oscillators. *Proceedings of the Institution of Civil Engineers, Engineering and Computational Mechanics*,

Thomas Telford, London, 2009, 162, No. 2, 87–97.

6. VAN DER HELDEN, A. M. A. (ed.) *W. T. Koiter's Elastic Stability of Solids and Structures*. Cambridge University Press, 2008