FROM THE EDITOR

This issue of the journal TASK Quarterly consists of five scientific papers which treat of the numerical modelling of the behaviour of granular bodies in different boundary value problems. Four papers discuss recent numerical simulations obtained with a discrete element method. One paper presents numerical results obtained with a finite element method based on continuum mechanics theory.

Granular materials play an important role in many of our industries, such as mining, agriculture and construction. They are rather simple materials since they consist of large conglomerations of discrete particles. However, despite their seeming simplicity they show quite strange physical behaviour and they can exhibit both solid-, fluid- or gas-like behaviour. During rest or slow flow they behave like solid whereas during rapid flow they can behave more like fluid or gas. Thus, their complex properties pose a difficult scientific challenge.

The existing theoretical models on the behaviour of granulates can be divided into models treating granulates as continuum and as separate particles. The first group of models consists of partial differential equations which are statements of mass, momentum and energy conservation, plus constitutive laws. To solve these equations, a finite element method is mainly used. It allows to consider large systems but cannot reproduce micro-mechanical effects due to the particulate character of the material. The second group of models considers granulates as a material composed of particles which displace independently from one another and interact only at contact points. The movements of individual particles of different shapes are calculated from Newton's laws of motion, considering the equilibrium of contact normal and contact tangential forces between each individual particle. These models apparently lead to a better understanding of the behaviour of granulates since they handle directly the particle properties. They build a necessary bridge between experiments and theories. Although numerical simulations with discrete element method are very expensive in calculation time, their meaning continuously grows with the appearance of new powerful computers.

Due to that the discrete element method is a future method allowing to obtain a better insight into the behaviour of granular materials, it is becoming more and more popular all over the world. Therefore, this issue of the TASK Quarterly deals mainly with this method by presenting the most recent numerical simulations on the

behaviour of granular materials for different boundary value problems in both quasi-static and dynamic regimes. The calculations are carried out by the outstanding specialists in the field of a discrete element method from Australia (P. Cleary), Germany (S. Luding), Japan (M. Oda and K. Iwashita) and Great Britain (C. Thornton). Advantages and limitations of a discrete element method are outlined. In contrast to these simulations, one numerical solution of rapid flow of granular material in a hopper with a finite element method taking into account a polar elasto-plastic constitutive model is demonstrated.

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