Discrete Element Analysis

of

Granular Materials
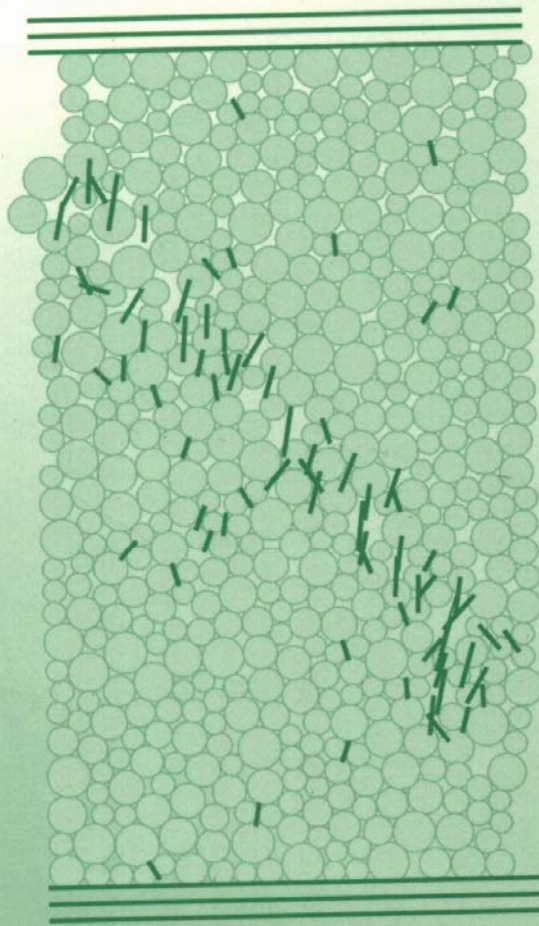
Stefan van Baars

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In 1979 Cundall developed a computer model, based on the basic elements of the granular materials, i.e. the grains themselves and their interactions, to describe the behaviour of these materials. Lindhout tried in 1992 to use this model to describe a sandstone cylinder. Due to compaction problems, stability problems and the large computational time this could not be done.

Therefore a new model was developed by the author, which does not use the equations of motion but the equations of equilibrium to calculate the new grain positions. This model can not only be used for non-cohesive grains but also for cohesive grains. The results can generally be described by an advanced Mohr-Coulomb model.

However, during loading of a granular structure, many contacts between the grains will collapse. Not due to shear deformation as Coulomb suggests, but due to tension failure. These micro cracks always occur in the direction of the major principal stress, which might be a different direction than the observed failure surface.