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Ekaterina Kim and Svetlana Shafrova[1,2)]
[1)] St. Petersburg State Polytechnic University, Russia
[2)] University Centre on Svalbard (UNIS), Norway

MODELLING ICE RUBBLE WITH PSEUDO-DISCRETE CONTINUUM MODEL. BI-AXIAL TEST

The idea of pseudo-discrete continuum model (PDCM) for ice rubble mechanical behavior under bi-axial test conditions that intodueced in [1] is presented in this paper.

The pseudo-discrete continuum model of the ice rubble is a combination of a discrete particles assembly and finite element (FE) analysis of this assembly. The modeling procedure consists of two basic steps. First, the assembly of rectangular blocks is generated by block assembly generator, secondly the output of this program is used as a geometrical input for the FE analysis to study its behavior under bi-axial test conditions.

Generation of block assembly.

The block assembly generator (C++ program) was developed by Alexei Privalov. The closed trapezoid or rectangle contour was randomly filied with rectangular blocks under the given porosity. User can choose as the dimensions of the filled contour as the block size. Coefficient of restitution and position of the attraction line can be chosen as control parameters that determined the packing properties of the assembly. Coefficient of restitution was introduced by program's author in order to handle impact type (may also reffered as contact). Impact type represents momentum exchange between the two blocks. The coefficient of restitution was 0.8 that is almost elastic impact. Output text file was used as geometrical input in FE pre-processing. Graphical output from the block generator is presented on Fig. 1.

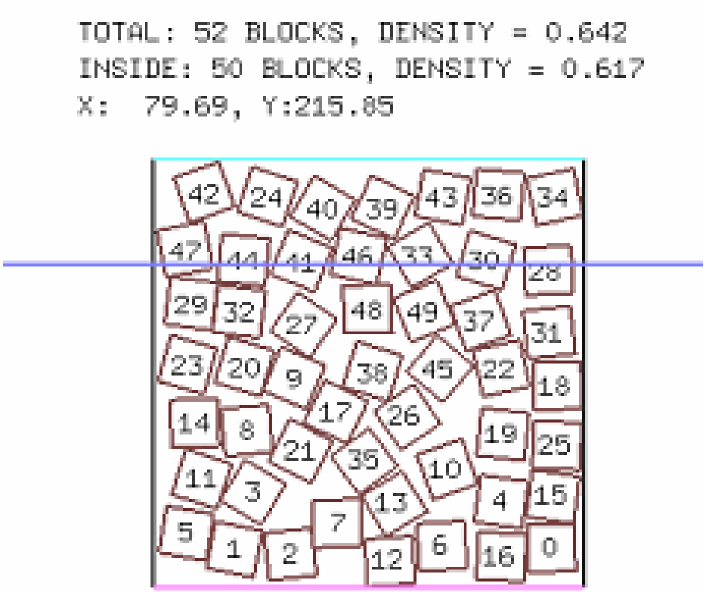

Fig. 1. Block generator graphical output

Finite element model.

For FE analysis PLAXIS/2D Professional Version 8 FE code [2] was chosen. Numerical simulations of the bi-axial test were made. Temperature changes of the blocks during the test were ignored. Input pre-processing except geometry and boundary conditions was chosen as for direct shear test numerical modelling in [3]. Geometrical scheme of bi-axial test simulation is shown on Fig. 2. The calculation phase is under development. The deformation and failure surface inside the ice rubble is given in Fig. 3. It is planned to analyze output data post processing and to investigate effect of block size, porosity, mechanical properties of ice block and their contacts.

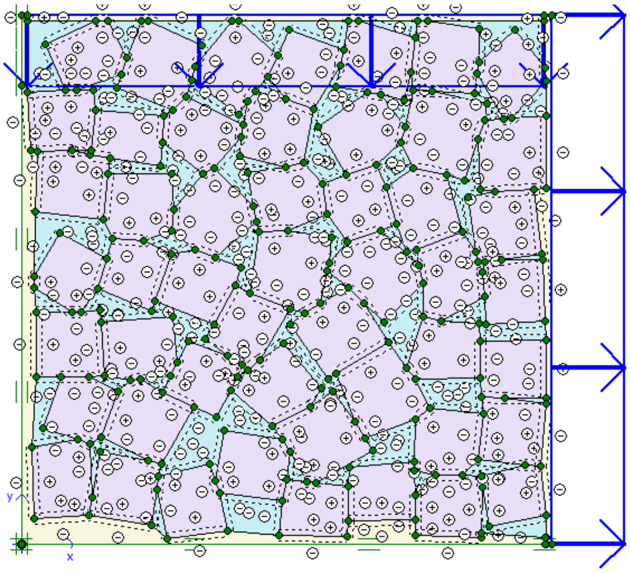

Fig. 2. Geometrical scheme of bi-axial test simulation

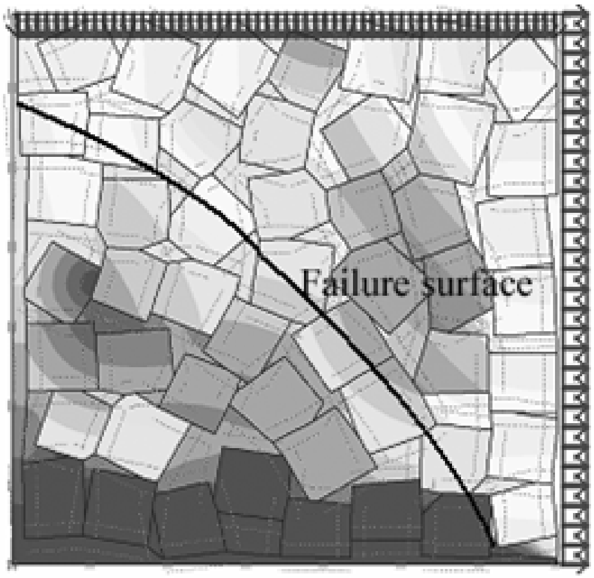

Fig. 3. Deformation and failure inside the ice rubble

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