UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Department of Civil and Environmental Engineering

Division of Geotechnical Engineering and Geosciences

PROJECT RISE GEO-RAMP (H2020 MSCA-RISE-2014 GA 645665)

ONE DAY SCHOOL: MATERIAL POINT METHOD FOR GEOHAZARDS

UPC 17/10/2016

PROGRAM

Time	TITLE	SPEAKER
09.00-09.15	Opening	
09.15-10.45	Basic formulation. Field equations. Discretization. Algorithms. BC	Rubén Rodari (U SanJuan)
10.45-11.00	Coffee break	
11.00-12.00	Numerical themes. Stability and convergence. Updating stress and strain. Cross-over noise. Locking. Reduced integration	Rubén Rodari/ Francisco Zabala (U SanJuan)
12.00-13.30	u-p formulations and hydromechanical coupling: applications for saturated soils	Francisco Zabala (U SanJuan)
13.30-14.30	Lunch	
14.30-15.30	v-v formulations and three-phase problems: applications to unsaturated soils	Nuria Pinyol (UPC)
15.30-15.45	Coffee break	
15.45-17.00	Applications: rapid landslides and granular flows	Nuria Pinyol (UPC) / Antonia Larese (CIMNE)

Presentation

MPM is a numerical method capable of modelling large deformations. Over the last years it has become an powerful tool to handle geotechnical problems including coupled flow-deformation problems in saturated and unsaturated soils.

The method requires the definition of two different spatial discretization schemes to describe materials as continuous media. A mesh fixed in the space (Eulerian) is defined covering the entire domain. Materials are discretized in subdomains and the mass of such subdomains is concentrated at materials points. These material points move attached to the deforming media (Lagrangian description) and carry all the information (state variables and properties) and the background fixed mesh is the support to solve the governing equations.

The course provides the basic concepts and mathematical formulation of MPM. Details on the numerical implementation and the spatial and the time discretization of the governing equations will be given. Special attention will be given on numerical aspects that lead to numerical instabilities and convergence problems. Procedures to mitigate such numerical difficulties will be described.

The basic formulation for a single phase (solid) will be extended to two-phase (solid and fluid) and three-phase (solid, fluid and gas) with direct applications to saturated and unsaturated soils. Several examples will be finally presented.

The course is mainly aimed at those who are familiar with the developments and use of numerical methods and are interested in knowing MPM formulation details, its numerical implementation and its capabilities to solve large displacement problems in Geotechnical Engineering.

Francisco Zabala, Núria Pinyol
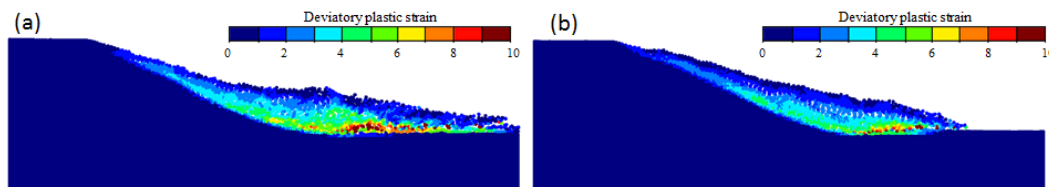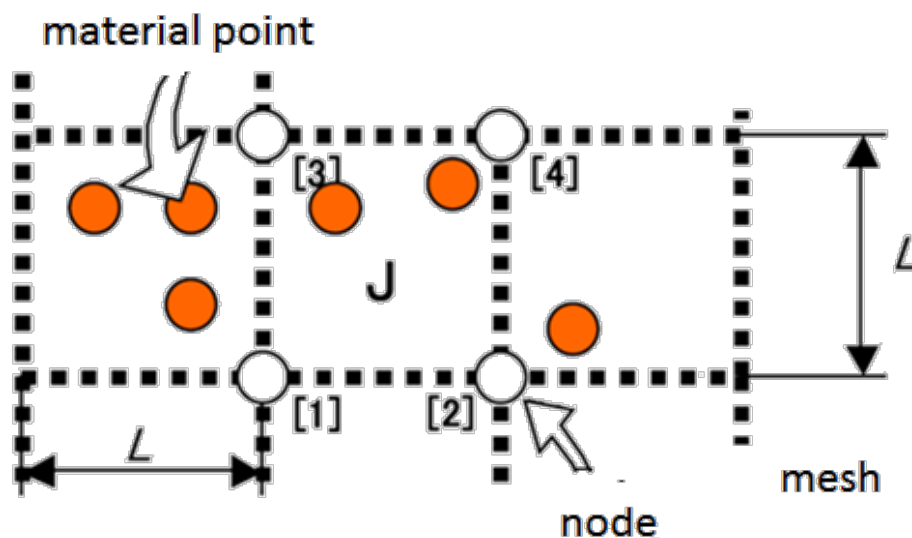
Speakers

Prof. Francisco Zabala, Universidad de SanJuan, Argentina

Dr. Rubén Rodari, Universidad de SanJuan, Argentina

Prof. Nuria Pinyol, UPC, España

Dr. Antonia Larese, CIMNE-UPC, España

Conditions

Location: Couse lessons will be held at Building D2, Campus Nord, UPC, Barcelona, Spain (for directions see http://tinyurl.com/hoqumdf)

Date: 17 October 2016, Monday

Price: Inscriptions by GEO-RAMP partners 100€; Other inscriptions 120€. Documentation & catering included.

Inscriptions: course inscriptions are to be made through the following webpage http://congress.cimne.com/GEORAMP/frontal/Registration.asp