MONASH University

Numerical modelling of heavy rainfall induced landslide using the mesh-free smooth particle hydrodynamics (SPH) method.

A PhD project is available within the Geomechanics Group of the Department of Civil Engineering at Monash University (Australia) in partnership with The Commonwealth Scientific and Industrial Research Organisation (CSIRO). The project deals with landslide issues – SPH simulation and/or laboratory tests. Applications are invited for the next round of PhD scholarship at Monash University with deadline May 31st 2015.

Project Outline

Slope failures and landslides cause significant damage to infrastructure and loss of life around the word each year. Therefore, to help protect people and infrastructure against such effects it is important to have proper numerical tools that are capable of predicting such events before they happen. However, modelling such events is very challenging because the slope failures and landslides involve the transitions between solid-like and fluid-like states, phase interaction modelling, appropriate boundary constraints and constitutive modelling; all within the context of motions with complexities on many scales. Furthermore, existing numerical methods are not capable of predicting the large deformation and flow failure behaviour of geomaterials. The purpose of this research is to develop a robust numerical modelling approach capable of accommodating these phenomena with the primary initial goal of predicting possibility of landslide due to heavy rainfall. The basic approach is based on adapting and extending the Smoothed Particle Hydrodynamics (SPH), which is well-suited to modelling large deformation, flow-like phenomena.

The first stage of the work will deal with the development of a general SPH framework (from an existing SPH platform) capable of solving the fully coupled unsaturated seepage flow and unsaturated soil deformation. An unsaturated soil constitutive model will be implemented in the SPH framework to describe progressive soil failure due to seepage flows. In a second stage, a procedure for the identification and calibration of model parameters will be proposed based on well-documented case studies. Finally, the developed model will be applied to some selected field applications and will provide a Design Aid Tool to geotechnical design's stakeholders enabling them to predict the possibility of slope failures and landslides associated with heavy rainfall events.

The Opportunity

The PhD scholarship is for 3 years full-time research towards a PhD. A tax-free stipend ($25,849 per annum) is provided. There is potential for the applicant to earn additional money through assistance in undergraduate teaching. Attendance at both national and international conferences will be expected and funded during the course of the degree. The applicant will work with an internationally recognized research group specializing in computational geomechanics.

Candidates must meet the eligibility criteria for PhD. candidature at Monash University:
http://www.monash.edu.au/migr/apply/

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Selection Criteria

The successful candidate must meet ALL of the following criteria:

1) Holding Bachelor of Engineering Degree with H1 Honours or equivalent (majoring in civil engineering or computer science), or Bachelor of Science Degree with H1 Honours or equivalent (majoring in mathematics or physics), or Master's Degree in the above fields.
2) An excellent academic record.
3) Candidates should have a good understanding of solid mechanics, a good knowledge of numerical methods to solve systems of partial differential equations, an essential knowledge of soil mechanics, plus a pronounced interest for Geo-Engineering. Familiarity with at least one computer language, such as FORTRAN, C, or C++, is a distinct advantage.

Applications

All applicants will go through the standard application process for a research degree at Monash. Details of the application procedure can be found at:
http://www.eng.monash.edu.au/research/apply/

Applicants need to submit a cover letter (specifying interests, qualifications and experience as it relates to the project) and a detailed CV to Ha.Bui@monash.edu prior to lodge their application to Monash.

Closing date: May 31, 2015

Further Enquiries

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