PhD Position
Force Inferred from Macroscopic Loading and grain Motions (FILM)

Project summary

[En] In recent times, imaging techniques have achieved tremendous progress, whereby key insights in the relationship between microscopic (grain) and macroscopic (granular material) scales came to light. However, these techniques lack the ability to probe one crucial aspect of granular materials at the grain scale: **inter-particle contact forces**. This is exactly what the Ph.D challenge is about.

The inference of contact forces, *via* inverse analysis, will be achieved by coupling experimental measurements of particle kinematics and connectivity, with a particular variation of the Discrete Element Method, the so-called Non-Smooth Contact Dynamics (NSCD). Both 2D photographs and 3D x-ray images of granular (analogue) systems will be investigated.

[Fr] Ces dernières années, les techniques d'imagerie ont réalisé d'énormes avancées qui ont permis de mieux comprendre certains cheminements « micro-macro » en œuvre dans les matériaux granulaires. Ces techniques n'ont cependant pas encore accès à un aspect crucial des matériaux granulaires: les forces de contact entre les particules. Il s'agit précisément du challenge proposé.

La mesure des forces de contact, *via* une analyse inverse, sera réalisée en couplant des mesures expérimentales de la cinématique de particules et de leur connectivité, avec une variante particulière de la méthode des éléments discrets: la dynamique non régulière des contacts. Des photographies 2D, mais aussi des images tomographiques 3D de système granulaire (analogiques) seront étudiées.

Location and practical aspects

3 years PhD fellowship offer. The successful applicant will be hosted by the Laboratoire 3SR in the GéoMécanique team. He/she will work under the co-advising of Dr Vincent Richefeu, Pr Gaël Combe and Pr Cino Viggiani from Laboratoire 3SR, and Pr Jean-Noël Roux from Laboratoire NAVIER.

The gross salary will be 1787 euros/months, equivalent to a net salary of 1452 euros/month.

Required background and skills

The PhD student will need to master several techniques, from computational mechanics to image processing. A solid background in one at least of the fields of continuum mechanics, image processing, numerical simulation of discrete media is a prerequisite. Curiosity, autonomy and willingness to develop new skills are also necessary.

Applications

Interested candidates should send their CV and cover letter to

Vincent.Richefeu@3sr-grenoble.fr or Jean-Noel.Roux@ifsttar.fr

Deadline for the application: 25th of June 2015

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