IH140100035 (Yu, ARC Research Hub):

Project title: ARC Research Hub for Computational Particle Technology (2018 Report)

This ARC Research Hub aims to develop and apply advanced computational particle technology to model and optimise complex particulate and multiphase processes in the mineral and metallurgical industries, through close collaboration with leading international companies such as Rio Tinto, Baosteel, Longking and Jiangsu Industrial Technology Research Institute (JITRI). This will be done through achievement of the following.

The specific objectives are:
1) to develop novel and comprehensive theories and techniques to study and quantify not only the interaction forces but also the heat and mass transfer between particles (including nanoparticles), and between particle and fluid under various conditions;
2) to develop generic theories and corresponding computational technology for particle scale simulation of complex particulate and multiphase processes which may have widely distributed particle sizes and shapes, and multiphase flow strongly coupled with heat and mass transfer;
3) to develop and generalise an effective method to link the discrete and continuum approaches, and formulate, based on the particle scale results, the governing equations, constitutive relations and boundary conditions that can be implemented in continuum-based process modelling and optimisation;
4) to apply the developed theories and simulation/modelling techniques to solve challenging problems associated with various processes or operations in the minerals, metallurgy and materials industries; and
5) to establish an advanced research platform to train postdoctoral fellows and research students in computational particle technology.

The ARC Research Hub for Computational Particle Technology (CPT) represents a significant research into particle science and technology in Australia and is jointly funded by the Australian Research Council and four international industrial partners, both from within Australia as well as overseas.

The Hub commenced operation on 27 Oct 2016. 29 projects were signed off in the first round, and 3 more projects were added to the Hub’s portfolio in the following year, both research agreements and IP agreements of the 32 projects are in place to govern the progress of the projects.

The hub researchers and the industry partners have been collaborating on affiliated projects for over two years. As it stands, the hub has attracted more than $7M funds from international companies such as JITRI, Rio Tinto, Baosteel and Longking; published 32 scholarly journal papers and 5 conference papers; delivered 22 technical reports to the industry partners, and held/co-held one international conference and three international symposiums during 2018.

The 2018 Hub Management Committee meeting was held in Monash Suzhou on May 26th, which was attended by the director, vice directors, node directors, and industry representatives. The framework of the Hub’s operation, communications between different nodes, and how to engage with industry partners effectively were discussed, and consolidated.

The progress of the research projects are on track and most of the subprojects have over researched their milestones. 53 postgraduate students (25 of which are partially supported by the hub) and 26 postdoctoral / research fellows are working on the core Hub projects, 10 students were graduated with their PhD degrees based on their works which are relevant to the Hub’s research themes. Over 30 national and international scholars and technical staff visited the Hub last year and a number of workshops were organised between the Hub researchers and our industry partners. JXUST (Jiangxi University of Science and Technology) applied to join the Hub as a partner organisation and was approved by ARC in early 2019, which will enhance the collaboration of the Hub and industries associated with JXUST. Four public lectures were given by researchers from the Hub during 2018 which gave a great social impact regarding how the scientific outcomes can make a change in our daily life.