演　講　公　告

Application of Modern Computational Architectures to Water Flow and Ecological System Simulation

演 講 者：Prof. Matthew Smith
服務單位：Mechanical Engineering Department, NCKU
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Speaker: Prof. Matthew Smith, Mechanical Engineering Department, NCKU

Partial Differential Equations (PDE's) are a mathematical tool commonly employed to model real life systems. However, in all but the simplest cases, these equations have no analytical solution – requiring application of a numerical method in order to obtain an approximate solution. In conservative form, these PDE's can be numerical solved using Finite Volume Methods (FVM's), which aim to compute the evolution of the conserved quantities in many small finite volumes (or cells) by tracking movement of conserved quantities across cell interfaces, otherwise known as fluxes. This process can be computationally intensive for 2D and 3D transient problems – it is not uncommon for solution to some complex PDE's to require many days for a modern computer to solve. In order to accelerate the computation, we may take advantage of modern computational architectures – nowadays, most CPUs contain multiple cores, all of which support SIMD style parallelization. The majority of this computational capacity is not automatically used when creating computer programs – the source code must explicitly control the manner of parallelization. In this talk, I will introduce to students methods by which they can accelerate their computations using modern computing hardware, and then apply these to simulations relevant to their current studies.

About the Speaker

- Graduated from University of Queensland (Australia) with PhD in Engineering in 2008.
- Previous work experience includes NCKU, NCTU, NARL (National Applied Research Laboratories), UQ, Boeing and the Royal Australian Air Force (RAAF).
- Awards include Australian Postgraduate Award (APA), National Teamwork Award (NARL), Young Engineer of the Year Award (CSME), and numerous conference best paper awards.
- Published over 60 journal articles, book chapters and conference papers. Also holds 2 patents related to parallel computing and numerical solution to PDEs.