**Engineering Simulation and Modelling Group part-funded studentship: project 3**

**Development of model independent control system design**

**Supervision team**: Professor Quanmin Zhu and Dr Pritesh Narayan

Dynamic system modelling and control is a must in many high-tech engineering applications and is an inter-disciplinary subject that crosses many technical boundaries. The control solution quality is key to optimal performance of products and processes.

In general, there are three frameworks for control system design. The two dominant frameworks are the model-based and model-free/data-driven approaches. The third is relatively new and referred to as model-independent or U-model-based approach. The first two have been well developed, but have inherent weaknesses in the use information for effective design. The third framework applies dynamic inversion to facilitate holistic control system design and specifies transient and steady state performance without the need for redundant work when the plant model changes. Thus it is believed that the U-control methodology is applicable to the optimisation of a wider range of applications.

The proposed PhD project will be expand on the developed results into the second layer design, in robust and adaptive control to deal with uncertainties and disturbance. The major objectives to achieve this aim include 1) application of U-control of systems with non-minimum phase and zero dynamics, 2) general robust analysis of designed nonlinear control system and the associated controller design, 3) simulated bench tests with MATLAB to provide reference for next stage lab scale validation. The candidate is expected to possess an excellent background in mathematics as well as MATLAB programming skills. The major outcome of this research will be highly ranked journal publications and the seeds for UK EPSRC biddings.

**For an informal discussion about the studentship**, please email [Quan.Zhu@uwe.ac.uk](mailto:Quan.Zhu@uwe.ac.uk)