2013 YCCSA SUMMER SCHOLARSHIP PROJECT SUBMISSION

This form is for prospective project supervisors to submit their projects to be included in the YCCSA Summer Scholarships Programme for 2013.

It is the purpose of the Summer School that any projects submitted are interdisciplinary in nature.

Date	*8 March 2013*
Main Supervisor's Name	*Simon Hickinbotham*
Main Supervisor's Department	*Computer Science*
Co-supervisors' name(s) and Departments	*Jim Austin (Computer Science), Supervisor from electronics (currently finalising)*
Project Title	*Artificial brains: degeneracy in comms and processing*
Project Description	*Established computer architectures tend to keep the task of communication (comms) separate from the task of processing. As systems become increasingly parallel, the comms overheads can increase exponentially, since each node has to (have the potential to) communicate with every other node in the system. The same problem must have been solved in nature as brain sizes increased. Natural systems are usually highly (but not completely) interconnected, and the functional roles of components in the system are often partially emulated by similar components. This concept is called "Degeneracy".* *This project would implement a system that uses a common hardware infrastructure called a "binary associative memory". These structures have been widely used for "soft" pattern matching programs in the neural network community. The novelty of this project is based on the observation that identical structures have also been used in a different way to control communications between arrays of processors. The project would examine the feasibility of using the same modules for processing and comms, how a degenerate system could be built using such an architecture, and what the benefits of the system are in terms of parallelising certain classes of pattern matching problems might be.* *The applications of the research would be in the domains of parallel processing and swarm robotics. In both of these domains, the processing tasks require frequent and dynamic communcation between agents in the system.*
Required skills	*Suitable candidates for the project must have good programming skills, plus a willingness and aptitude for building hardware.*
Project dates	*No special requirements*
Other information	*A small fund for purchasing suitable equipment will be provided by Cybula ltd.*
References	*Edelman, G.M. and J.A. Gally, Degeneracy and complexity in biological systems. Proceedings of the National Academy of Sciences, USA, 2001. 98(24): p. 13763-13768.*

When complete, please email the form to sarah.christmas@york.ac.uk