INVITED TALK: FROM SELF-AWARE ROBOTICS TO ADAPTIVE SILICON CHIPS: KNOBS AND MONITORS

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Talk summary

Biological inspiration in the design of computing machines finds its source in essentially three biological models: phylogenesis, the history of the evolution of the species, ontogenesis, the development of an individual as directed by his genetic code, and epigenesis, the development of an individual through learning processes influenced both by their genetic code and by the environment. These three models share a common basis: a one-dimensional description of the organism, the genome and contribute explicitly or implicitly to self-awareness in biological organisms. If one would like to implement some or all of these ideas in hardware (e.g. robots, silicon) can we achieve self-awareness? Do we need specifically designed-for-purpose hardware? This talk will consider some historical work on bio-inspired architectures before moving on to consider some recent work in collective robotics showing forms of self-repair and a new FPGA designed and fabricated specifically for bio-inspired work. It will consider some of the novel features present in this device, such as reconfigurable analogue components, which assist the implementation of capabilities such as self-repair and self-tuning.

About the speaker

Andy Tyrrell received a 1st class honours degree in 1982 and a PhD in 1985 (Aston University), both in Electrical and Electronic Engineering. He joined the Electronics Department at York University in April 1990, he was promoted to the Chair of Digital Electronics in 1998. His main research interests are in the design of biologically-inspired architectures, artificial immune systems, evolvable hardware, FPGA system design and real-time systems. This work has included the creation of embryonic processing array, intrinsic evolvable hardware systems and the immunotronics hardware architecture. He is Head of the Intelligent Systems research group at York. He has published over 280 papers in these areas. He is a Senior member of the IEEE and a Fellow of the IET.