ABC Robotics Monthly Seminar

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Title: Critical Brains for Autonomous Robots

Speaker: J. Michael Herrmann

Institute for Perception, Action and Behaviour, School of Informatics, University of Edinburgh and Edinburgh Centre for Robotics, Edinburgh, Scotland, United Kingdom

Research Interests: Dr. Michael Herrmann's research interests are in self-organization, robot learning, neural avalanches, auditory system, bio-medical data analysis, metaheuristic optimization, sensor fusion and information theory.

Abstract:

Self-organised criticality, according to Per Bak (1996), describes the way how nature works. While this is an intriguing perspective in the sciences, it is considered here as an interesting approach to robotics. In the talk, we will discuss benefits of critical dynamics in robotics and in particular in behavioural optimisation, self-motivated learning and seamless interaction. We start by reviewing critical networks in real neural systems and move on to neural control architectures that are inspired by the deep-learning paradigm. Next, we turn to embedded robots and applications in prosthetics and shared control and look briefly at the generation of complex behaviour in swarms of simple robots. While these examples might be sufficient to make a case for critical robots, it will also become clear that this approach is yet to realise its full potential. Currently problems are often due to the fact that robots usually have to serve a specific purpose, which is at odds with the exploratory nature of critical dynamics. As a solution, we present the concept of guided self-organisation which can reconcile criticality-derived flexibility and the goal-directedness required in robotic applications.