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Intelligence by Design: Building and Organising Heterogenous Modular Intelligent Systems

One of the dark secrets of AI is that, with all our progress in machine learning and reasoning, it still requires a lot of programming to make a working intelligent system. While we have established that modular decomposition benefits both design and learning, methodologies for developing complete AI systems are still scarce. Further, coordinating the behaviour of even semi-autonomous modular systems introduces another source of design complexity.

This talk describes an approach, Behavior Oriented Design (BOD) for engineering complex, modular, adaptive systems. Here I use `complex' to indicate a system that must arbitrate between potentially conflicting goals or behaviours. Common examples include autonomous robots and virtual reality characters, but the problems are shared by many other systems, such as intelligent tutors, medical monitors or intelligent environments.

Behavior Oriented Design builds on work in behavior-based and hybrid architectures for agents, and the object oriented approach to software engineering. It consists of an initial decomposition and an iterative development process which includes refactoring the original specification.

In addition to describing the design process itself, I will give a quick overview of past and present development projects, including a medical monitor device for assisting dementia patients, an artificial life model of the development of primate social behaviour, VR games characters and an autonomous mobile robot.