YCCSA Seminar Series
Summer 2018

An interdisciplinary seminar series hosted by the York Cross-disciplinary Centre for Systems Analysis aimed at researchers from all disciplines

Reservoir Computing *in materio*

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25 May 2018
Ron Cooke Hub, RCH/204 at 13:30

Abstract:
As the limitations of conventional computing approach, new paradigms are needed to satisfy a lust for computing power and more robust computing. Despite dominating computer science for half a century digital computing has taught us little about general principles of computation. For example, we understand little about the natural computing power of biological systems, or even non-biological ones, and often project our understanding of digital computation onto these systems.

In this talk, I will describe how a neuro-inspired computational framework called Reservoir Computing (RC) can be used to turn fixed disorganised substrates into small unconventional computers. In the first part, I show preliminary results using the framework on a small-scale setup and how it compares to a previous direct evolution approach. In the next part, I attempt to answer the challenging question; how to determine the *quality* of a substrate for RC. Evolving a substrate to a task is relatively simple, but understanding what properties are important to solve all tasks is non-trivial. Here I introduce a methodology to capture and map the quality of a system by experimentally measuring its dynamical degrees-of-freedom. The hypothesis is that mapping a wide range of system behaviours provides both a measure and sense of quality, as an increased capacity to function in many dynamical regimes implies a greater ability to tackle many task domains.

Lastly, I describe an extended large multi-substrate RC system that could compensate for future hardware scaling issues and enable a more general-purpose computing system.

The seminar includes a refreshment break to fuel interdisciplinary discussion

Ron Cooke Hub is on Heslington East Campus – accessible by free bus services
Nos. 66 and UB1 running at frequent intervals from Heslington West.
The YCCSA Seminar room is on the second floor