

Proposal for a New Research Programme on the Simulation and Synthesis of Living Systems

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1 Background

There is a long tradition in Edinburgh for research into biologically-inspired computing and robotics. Ideas such as distributed control, behaviour-based systems, self-organising and self-repairing systems, and the evolution of complex behaviours permeate research in various institutes in Informatics. This includes much of the work of the Mobile Robotics Group (IPAB), and research on evolutionary algorithms, ant colony optimisation and artificial immune systems (CISA). Interest in the conceptualisation of living organisation also reaches beyond Informatics, to the School of Philosophy, Psychology and Language Sciences (including the Language Evolution and Computation Research Unit, and the Department of Philosophy—with renewed emphasis following the recent professorial appointment of Andy Clark), as well as, of course, the School of Biological Sciences (e.g. the Institute of Evolutionary Biology).

Ten years ago, a cross-institute Evolutionary Computation Group was formed. This met regularly for a number of years, but less frequently after its original founders (Chris Gathercole, Andrew Tuson and Tim Taylor) left the Department of Artificial Intelligence. Within the last couple of years the group has become more active again, thanks to the organisation of John Levine (who recently moved to Strathclyde) and its current organiser, Richard Carter (CISA). In the mid-1990s, Tuson and Taylor also founded an inter-university group—the Lothian Evolutionary Algorithms Research Network (LEARN)—to encourage communication and collaboration between other researchers working in Edinburgh and nearby. LEARN held a workshop that was attended by over 40 participants from the Universities of Edinburgh, Heriot Watt, Napier and St Andrews. The workshop was followed up by a series of seminars. However, the activity of the network essentially ceased after the original organisers left the AI department.

Despite the informal and irregular nature of these groups, various researchers within and outwith Informatics continue to do active research in these areas. The recent recruitment of new staff has also led to a broader spectrum of research topics being pursued. Much of this research has a high international reputation, and yet it often remains the case that these groups meet each other more regularly at conferences on the other side of the world than they do at seminars within the School.

2 Purpose

The purpose of the new research programme is to formalize the existence of the cross-institute Evolutionary Computing Group, and to broaden its outlook to encompass other forms of biological inspiration (thereby reflecting the current diverse research activity within the School and associated groups). The establishment of a Programme would help both internally (e.g. having a proper mailing list for the group and a more visible method of announcing seminars etc), and externally (to give the School's work in this area greater visibility for outsiders). Given the recent turnover of staff (we have lost of number of key researchers in this area, but we have also gained other people interested in the subject, e.g. Andy Clark in Philosophy), plus researchers in other schools and institutions who share similar interests (e.g. Simon Kirby et al in the Language

Evolution and Computation Research Unit, and the recent arrival of Professor Ruth Aylett and her Synthetic Characters group at Heriot Watt), there is now, more than ever, a need to promote inter-institute, and inter-school, dialogue.

3 Activities

The main activity will be an internal seminar series, in which members of the Programme will describe their current research interests and activities. The venue will rotate about the sites of the Edinburgh-based members (normally they will take place in the University's central area), and meetings will be held fortnightly or monthly. Through these meetings it is hoped that collaborations will emerge, both in theoretical work and in practical applications (such as the development of intelligent virtual characters for computer games). The meetings will also offer the opportunity for networking with commercial contacts (e.g. in the computer games industry) already established by various group members.

4 Requirements

The Programme is intended to be a featherweight organisation and will not have a formal concept of membership. The Programme has no general need of a budget as such. We require web space on the Informatics server for a Programme web site, and an Informatics-hosted mailing list.

5 Initial Membership

This proposal has the support of the following academics:

- Tim Taylor (IPAB, soon moving to ICCS)
- Richard Carter (CISA)
- Gillian Hayes (IPAB)
- Barbara Webb (IPAB)
- Sethu Vijayakumar (IPAB)
- Marc Toussaint (IPAB/IANC)
- Simon Kirby (LEC, School of Philosophy, Psychology and Language Sciences)
- Andy Clark (Philosophy, School of Philosophy, Psychology and Language Sciences)
- Nick Barton (IEB, School of Biological Sciences)
- Ruth Aylett (School of Maths and Computer Science, Heriot Watt)
- Peter Ross (School of Computing, Napier)
- Ben Paechter (School of Computing, Napier)
- Mike Wheeler (Philosophy, Stirling)
- Jim TerKeurst (IC-CAVE, Abertay Dundee)