Using Temporal Logic to Specify Emergent Behaviours in Swarm Robotic Systems

Alan FT Winfield and Jin Sa
Intelligent Autonomous Systems Laboratory[1]
University of the West of England
Coldharbour Lane, Bristol BS16 1QY
*{***Alan.Winfield, Jin.Sa***}*@uwe.ac.uk

Mari-Carmen, Fern´andez-Gago, Clare Dixon and Michael Fisher
Liverpool Verification Laboratory[2]
Department of Computer Science, University of Liverpool
Liverpool L67 7ZF
*{***M.C.Gago, C.Dixon, M.Fisher***}*@csc.liv.ac.uk

Abstract

It is a characteristic of swarm robotics that specifying overall emergent swarm behaviours in terms of the low-level behaviours of individual robots are very difficult. Yet if swarm robotics is to make the transition from the laboratory to real-world engineering realisation we need such specifications. This paper explores the possibility of using *temporal logic* to formally specify, and possibly also prove, the emergent behaviours of a robotic swarm. The paper makes use of a simplified wireless connected swarm as a case study with which to illustrate the approach. Such a formal approach could be an important step toward a disciplined design methodology for swarm robotics.