Emergence of Task Specialisation in Homogeneous versus Heterogeneous Teams

Mostafa Rizk
Faculty of Information Technology, Monash University
Melbourne, Australia
mostafa.rizk@monash.edu

Julian García
Faculty of Information Technology, Monash University
Melbourne, Australia
julian.garcia@monash.edu

Aldeida Aleti
Faculty of Information Technology, Monash University
Melbourne, Australia
aldeida.aleti@monash.edu

Giuseppe Cuccu
eXascale Infolab, Department of Computer Science,
University of Fribourg
Fribourg, Switzerland
giuseppe.cuccu@unifr.ch

ABSTRACT

Foraging is a common task in the robotics domain that involves transporting resources from one location to another. It has analogues to many real world applications such as mining, space exploration and hazardous waste removal. Using a distributed multi-robot team is advantageous as the team is scalable and robust, but designing controllers is difficult. This is especially true when the team divides the task into different sub-tasks and sub-groups need to specialise. Evolutionary algorithms are a promising tool for controller design, however little work has been done evolving controllers for teams performing task specialisation. This paper examines a foraging scenario requiring task specialisation and explores the difference in performance of a heterogeneous and homogeneous team. In the heterogeneous setup, the sub-groups have different controllers and evolution uses individual selection. In the homogeneous setup, the sub-groups have the same controllers but perform different tasks depending on environmental cues, and evolution uses team selection. We provide results suggesting how to most effectively evolve a team that achieves high performane in this variant of the foraging problem that requires specialisation.

CCS CONCEPTS

• **Computing methodologies** → **Multi-agent systems**; **Cooperation and coordination**; **Modeling and simulation**;

KEYWORDS

Evolutionary algorithms; Cooperation; Division of labour

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1 INTRODUCTION

Hypothesis: The larger the theta, the more likely the heterogeneous setup is to outperform the homogeneous setup

2 SUMMARY OF RESULTS

REFERENCES