Balancing Quality and Quantity in Evolving Agent Systems

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1. INTRODUCTION

We investigate a calibration problem within an evolutionary agent system. We consider the evolution of a good foraging strategy in the NEW TIES [1]system [1]. In NEW TIES individuals die and are being born asynchronously, without central control. Consequently, the population size changes over time. We address two problems: How to calibrate system parameters so that (1) a good strategy can evolve, (2) the population neither explodes, nor implodes?

The system designer has two options: using a bias towards (1) high quality by exercising high selection pressure, and (2) large quantity by creating many individuals. To manipulate quality and quantity we selected the MateAge and MaxEnergy parameter. MateAge determines the minimum age at which an agent is able to reproduce. When MateAge is low, agents can reproduce soon after birth –after a short test period they need to survive to prove their worth. With high MateAge, the effect is inverse. MaxEnergy determines the maximum amount of energy that an agent can accumulate. High MaxEnergy allows that agents live long and produce many offspring, even if they are born with a bad controller. Here we test one low and one high value for both parameters leading to four cases, A through D (Table 1) [2].

Figure1 shows system behavior for each case plotting the $g(t)$ values calculated over 15 runs, where $g(t)$ is:

$$g(t) = \frac{\text{no of good eat actions}}{\text{no of all eat actions}} * \frac{\text{no of poisonous plants}}{\text{no of all plants}} \quad (1)$$

[1]New and Emerging World models Through Individual, Evolutionary and Social learning, EU FP6 Project, http://www.newties.org

[2]For more details see http://www.cs.vu.nl/∼gusz/#Resources

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Table 1: Combined effect of MateAge and MaxEnergy parameter values on Quantity bias (QTB) and Quality bias (QLB).

	MateAge	
Max-Energy	Low	High
High	Case **A** QTB = $\langle Hi, Hi\rangle$ QLB = $\langle Lo, Lo\rangle$	Case **B** QTB = $\langle Lo, Hi\rangle$ QLB = $\langle Hi, Lo\rangle$
Low	Case **C** QTB = $\langle Hi, Lo\rangle$ QLB = $\langle Lo, Hi\rangle$	Case **D** QTB = $\langle Lo, Lo\rangle$ QLB = $\langle Hi, Hi\rangle$

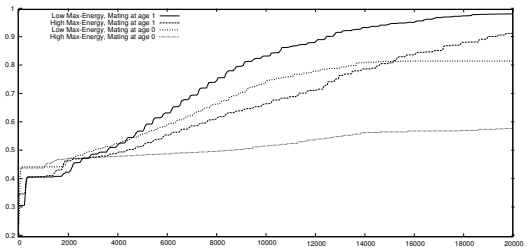

Figure 1: The results of the four different setups

The results suggest that a bias towards quantity is more useful (Case A), while a purely quality oriented system (Case D) proved to be counterproductive here.

We are aware of the fact that the scope of our technical findings –about specific parameter values– is limited to the system we studied (as is the case for much of the literature in the field). However, we believe that the approach towards generalization –in terms of abstract concepts– is fruitful, and we have shown an example of how this can be carried out.

2. REFERENCES

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