
Experimental Study of Isolated Multipopulation Genetic Programming

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Abstract

In this paper we present some results obtained when comparing classic Genetic Programming (GP) with the isolated multipopulation version. Our first discovery was that sometimes, given a certain number of individuals, it is useful to distribute them among several populations even when no communication is allowed.

1 ISOLATED MULTIPOPULATIONS GENETIC PROGRAMMING

Using a large population is not always the best way of solving a problem when working with GP [Fuchs]. Although simple, the idea of dividing a large population into several smaller ones and distributing them over a set of processors is interesting because it allows us to perform several tasks in parallel. The same algorithm can thus be simultaneously run on several processors. This method enables us to study an evolutionary algorithm without changing it when carrying out experiments.

However we could think in terms of populations and subpopulations rather than repeating the same experiment N times. We can execute a population of I individuals on a processor, which will need T units of time, or we can divide the population into M subpopulations. Then we could execute them on M different processors, employing T/M units of time. The time saved is the same as in the previous case. We now consider that all the M subpopulations make up a bigger population. The best fitness must thus be obtained by comparing the best fitness of each subpopulation and selecting the best among those values. No mean is calculated. This idea is different from that of obtaining the best fitness value using just one population on a processor, which would give us no *best individuals* to compare.

By means of a series of experiments we have compared the isolated multipopulation version of GP with the classic version. On some problems, the classic version is always better than Isolated Multipopulation GP (IMGP). On other problems, IMGP gives better results than GP, but only when using a given number of populations and individuals (see Figure 1). These results seem to indicate

that there is a close relationship between the number of individuals and the number of populations employed when solving a problem [Fernández et al]. Furthermore, IMGP shows different behavior depending on the problem we are working with.

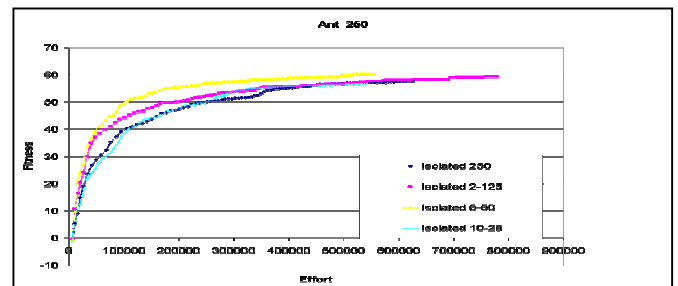


Figure 1: 5 subpopulations each with 50 individuals, perform better than 1 population with 250 individuals in the *Ant* problem

2 CONCLUSIONS

Concerning number of populations, sizes and distribution, we can come to several conclusions: first of all, testing a problem with IMGP as compared to classic GP is useful in studying the nature of the problem search space. IMGP is a good choice in some problems. Secondly, the results we get in each problem depend on the total number of individuals we employ and at the same time, on the number of populations we use to distribute them. Different problems give different results when using the same configuration. This leads us to believe that the shape of the search space is a decisive influence on the usefulness of IMGP or classic GP.

3 REFERENCES

- [Fuchs] M. Fuchs: "Large Populations are not always the best choice in Genetic Programming". Proceedings of the Genetic and Evolutionary Computation Conference GECCO 1999.
- [Fernández et] F. Fernández, M Tomassini, W. Punch, J.M Sánchez. "Experimental Study of Multipopulation Parallel Genetic Programming". To appear, Euro Gp 2000.