

On Parameters of Migration in PEA Computing

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DOI:10.34658/9788366741928.78

Abstract.

Metaheuristics, such as evolutionary algorithms have been proven to be (also theoretically, see works of Vose [1]) universal optimization methods. Skolicki and DeJong [2] researched impact of migration intervals on island models. In this article, we explore different migration intervals and amounts of migrating individuals, complementing Skolicki and DeJong's research. In our experiments we use different ways of selecting migrants and pave the way for further research, e.g. involving different topologies and neighborhoods. Besides sketching out the background and presenting the idea of the algorithm we show the experimental results and discuss them in detail.

Keywords: parallel evolutionary computing, metaheuristics, migration

1. Introduction

In our research, we investigated the operation of the island model of evolutionary algorithms on two problems: Rastrigin i Sphere (De Jong's function) on dimension=200 both, using three versions of selection strategies on the source island: 'best', 'max distance' and for comparison: 'random' strategy. We tested the performance of four different migration intervals and four different numbers of migrants in six experimental setups.

2. Preliminary results

We obtained the highest improvement for the Sphere problem with selection of migrants 'best' strategy. while for the Rastrigin problem, the most cases of improvement were for 'max distance' and the greatest improvement in terms of value for 'best' strategy. We can see Sphere results on Fig. 1 (right). The results of one island model is showed as red bar, five island results are green.

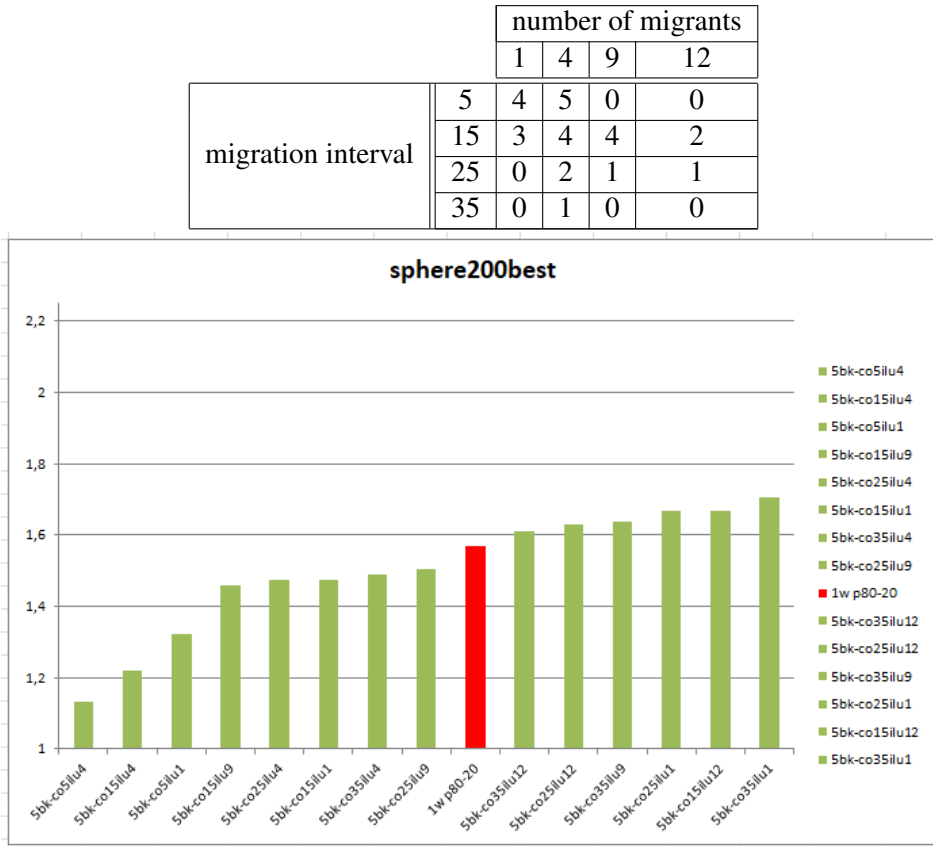


Figure 1. Top: Comparative: number of improvements in six five-island cases in relation to the score of one-island, obtained for the examined intervals and number of migrants, Bottom: Improvement in case of Sphere problem 'best' strategy. Source: own work.

3. Conclusion

Experimental results for the vast majority of experiments showed promising results for our 5-island settings compared to the single-island. Only using a random strategy of selecting migrants, the improvement was almost invisible. In addition, on Fig. 1 (left), we observed an improvement in the results with a small, but not too small, both the migration interval and the number of emigrants. In conclusion, it is worth looking for more accurate relationships between the above-mentioned parameters, topology and population size in the island model in order to obtain efficient versions of large-population evolutionary algorithms.

Acknowledgements

Presented research has been financially supported by Polish National Science Center Grant no. 2019/35/O/ST6/00571 “Parallelization of metaheuristics with desynchronization.”

References

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