

Figure 1: Best runs for the Dinic algorithm

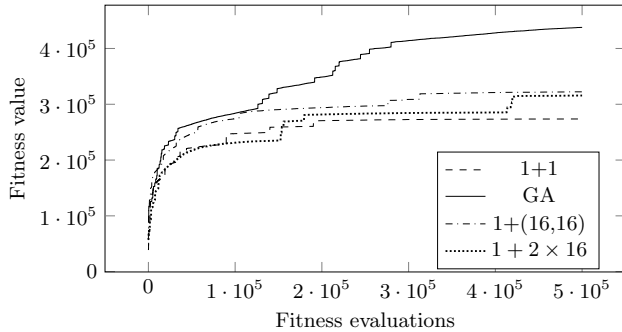


Figure 2: Median runs for the Dinic algorithm

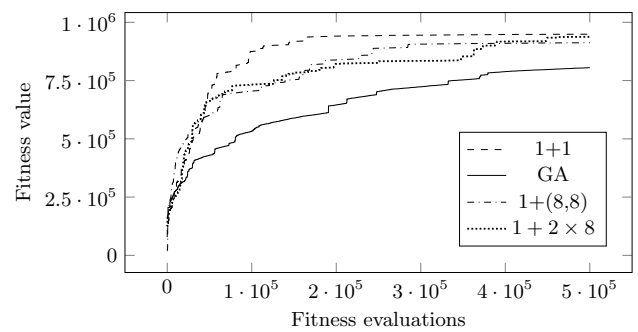


Figure 3: Best runs for the ISP algorithm

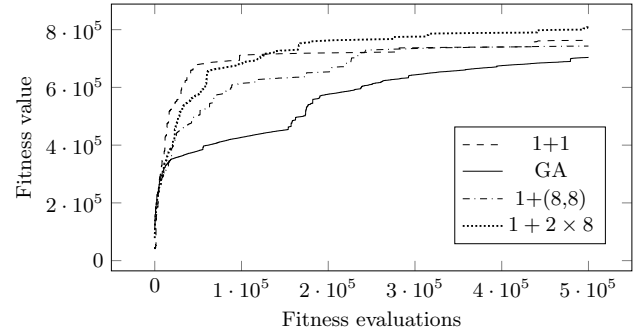


Figure 4: Median runs for the ISP algorithm

considered maximum flow algorithms, which suggests that the adaptation heuristic seems to be overfitted for ONEMAX and is not promising for at least some other problems.

On the problem of maximum flow test generation, the $(1 + (\lambda, \lambda))$ EA showed itself a rather good default choice which is almost insensitive to the generation size. However, there probably exist some ways to tailor this algorithm using a suitable heuristic to the considered problem, which, in turn, may serve as a starting point to more general methods of improving the running time of the $(1 + (\lambda, \lambda))$ EA for more general classes of problems.

The source code for the experiments is published at GitHub¹. This work was financially supported by the Government of Russian Federation, Grant 074-U01.

6. REFERENCES

- [1] DIMACS. Test generators for the maximum flow problem. <http://www.informatik.uni-trier.de/~naeher/Professur/research/generators/maxflow>.
- [2] R. K. Ahuja, T. L. Magnanti, and J. B. Orlin. *Network Flows: Theory, Algorithms, and Applications*. Prentice-Hall, Inc., Upper Saddle River, NJ, USA, 1993.
- [3] M. Buzdalov and A. Shalyto. Hard test generation for augmenting path maximum flow algorithms using genetic algorithms: Revisited. In *Proceedings of IEEE Congress on Evolutionary Computation*, 2015 (to appear).
- [4] T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein. *Introduction to Algorithms, 2nd Ed.* MIT Press, Cambridge, Massachusetts, 2001.
- [5] E. A. Dinic. Algorithm for solution of a problem of maximum flow in networks with power estimation. *Soviet Math. Dokl.*, 11(5):1277–1280, 1970.
- [6] B. Doerr, C. Doerr, and F. Ebel. From black-box complexity to designing new genetic algorithms. *Theoretical Computer Science*, 567:87–104, 2015.
- [7] J. Edmonds and R. M. Karp. Theoretical improvements in algorithmic efficiency for network flow problems. *Journal of the ACM*, 19(2):248–262, 1972.
- [8] L. R. Ford Jr. and D. R. Fulkerson. Maximal flow through a network. *Canadian Journal of Mathematics*, 8:399–404, 1956.
- [9] A. V. Goldberg and R. E. Tarjan. A new approach to the maximum flow problem. In *Proceedings of the Eighteenth Annual ACM Symposium on Theory of Computing*, pages 136–146, New York, NY, USA, 1986. ACM.
- [10] D. Goldfarb and M. D. Grigoriadis. A computational comparison of the Dinic and network simplex methods for maximum flow. *Annals of Operations Research*, 13(1):81–123, 1988.
- [11] P. S. Oliveto and C. Witt. On the runtime analysis of the simple genetic algorithm. *Theoretical Computer Science*, 545:2–19, 2014.
- [12] R Core Team. R: A language and environment for statistical computing. <http://www.R-project.org/>, 2013.
- [13] N. Zadeh. Theoretical efficiency of the Edmonds-Karp algorithm for computing maximal flows. *Journal of the ACM*, 19(1):184–192, 1972.

¹<https://github.com/NinerLP/papers/tree/master/one-ll>