

在图 3 的散点图中,才会有 STRbit 在多数实例上效率优于 STR2*的效果.

4 总 结

我们提出了一种表约束上维持 GAC 的算法 STR2*,采用了一种新的动态维持元组集有效部分的方法.实验结果证实,STR2*维持 GAC 的效率均高于 STR2 和 STR3,并且在元组集缩减较快的问题以及元组集规模较小的问题上优于最新的采用表压缩的 STRbit.今后,我们将这种新的动态维持元组集有效部分的方法运用到其他基于 STR 的算法中.

References:

- [1] Dechter R. Constraint Processing. Morgan Kaufmann, 2003.
- [2] Ullmann JR. Partition search for non-binary constraint satisfaction. Information Science, 2007,177:3639–3678.
- [3] Briggs P, Torczon L. An efficient representation for sparse sets. ACM Letters on Programming Languages and Systems, 1993, 2(1-4):59–69.
- [4] de Saint-Marcq VLC, Schaus P, Solnon C, Lecoutre C. Sparse-sets for domain implementation. In: Proc. of the CP Workshop on Techniques for Implementing Constraint Programming Systems (TRICS). 2013. 1–10.
- [5] Lecoutre C. STR2: Optimized simple tabular reduction for table constraints. Constraints, 2011,16(4):341–371.
- [6] Lecoutre C, Likitvivanavong C, Yap RHC. STR3: A path-optimal filtering algorithm for table constraints. Artificial Intelligence, 2015,220:1–27.
- [7] Lecoutre C, Likitvivanavong C, Yap RHC. A path-optimal GAC algorithm for table constraints. In: Proc. of the 20th European Conf. on Artificial Intelligence. 2012. 510–515.
- [8] Likitvivanavong C, Xia W, Yap RHC. Higher-order consistencies through GAC on factor variables. In: Proc. of the Int'l Conf. on Principles and Practice of Constraint Programming. 2014. 497–513.
- [9] Yang MQ, Li ZS, Li Z. Optimizing MDDc and STR3 for solving constraint satisfaction problem. Ruan Jian Xue Bao/Journal of Software, 2017,28(12):3156–3166 (in Chinese with English abstract). <http://www.jos.org.cn/1000-9825/5242.htm> [doi: 10.13328/j.cnki.jos.005242]
- [10] Lecoutre C, Likitvivanavong C, Yap RHC. Improving the lower bound of simple tabular reduction. Constraints, 2015,20(1): 100–108.
- [11] Cheng K, Yap RHC. An MDD-based generalized arc consistency algorithm for positive and negative table constraints and some global constraints. Constraints, 2010,15(2):265–304.
- [12] Xia W, Yap RHC. Optimizing STR algorithms with tuple compression. In: Proc. of the Int'l Conf. on Principles and Practice of Constraint Programming. 2013. 724–732.
- [13] Katsirelos G, Walsh T. A compression algorithm for large arity extensional constraints. In: Proc. of the Int'l Conf. on Principles and Practice of Constraint Programming. 2007. 379–393.
- [14] Jefferson C, Nightingale P. Extending simple tabular reduction with short supports. In: Proc. of the 23rd Int'l Joint Conf. on Artificial Intelligence. 2013. 573–579.
- [15] Gharbi N, Hemery F, Lecoutre C, Roussel O. Sliced table constraints: Combining compression and tabular reduction. In: Proc. of the 11th Int'l Conf. on Integration of Artificial Intelligence and Operations Research Techniques in Constraint Programming. 2014. 120–135.
- [16] Wang R, Xia W, Yap RHC, Li Z. Optimizing simple table reduction with bitwise representation. In: Proc. of the Int'l Joint Conf. on Artificial Intelligence. 2016. 787–795.
- [17] Demeulenaere J, Hartert R, Lecoutre C, Perez G, Perron L, Régim JC, Schaus P. Compact-table: Efficiently filtering table constraints with reversible sparse bit-sets. In: Proc. of the Int'l Conf. on Principles and Practice of Constraint Programming. Springer Int'l Publishing, 2016. 207–223.
- [18] Karakashian S, Woodward R, Reeson C, Choueiry BY, Bessiere C. A first practical algorithm for high levels of relational consistency. In: Proc. of the Conf. on Artificial Intelligence (AAAI 2010). 2010. 101–107.

- [19] Shant K, Woodward RJ, Choueiry BY. Improving the performance of consistency algorithms by localizing and bolstering propagation in a tree decomposition. In: Proc. of the AAAI. 2013.
- [20] Mairy JB, Deville Y, Lecoutre C. Domain k -wise consistency made as simple as generalized arc consistency. In: Proc. of the CPAIOR 2014. 2014. 235–250.
- [21] Lecoutre C, Paparrizou A, Stergiou K. Extending STR to a higherorder consistency. In: Proc. of the AAAI 2013. Washington, 2013. 576–582.
- [22] Janssen P, Jegou P, Nouguié B, Vilarem MC. A filtering process for general constraint-satisfaction problems: Achieving pairwise-consistency using an associated binary representation. In: Proc. of the IEEE Workshop on Tools for Artificial Intelligence. 1989. 420–427.
- [23] Likitvivanavong C, Xia W, Yap RHC. Decomposition of the factor encoding for CSPs. In: Proc. of the 24th Int'l Joint Conf. on Artificial Intelligence. 2015. 353–359.
- [24] Boussemart F, Hemery F, Lecoutre C. Revision ordering heuristics for the constraint satisfaction problem. In: Proc. of the CPAI 2004 Workshop Held with CP 2004. 2004. 29–43.

附中文参考文献:

- [9] 杨明奇,李占山,李哲.优化求解约束满足问题的 MDDc 和 STR3 算法.软件学报,2017,28(12):3156–3166. <http://www.jos.org.cn/1000-9825/5242.htm> [doi: 10.13328/j.cnki.jos.005242]



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