

SHORT COMMUNICATION: LARGER CLIQUES FOR A DIMACS TEST

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1. THE NEW CLIQUES

DIMACS benchmarks for the Max-Clique problem have been introduced more than ten years ago for the 2nd DIMACS Implementation Challenge [1] and became a well established testbed for exact and heuristic algorithms. For many of these benchmarks the exact optimal value is known but for some of them it is not and for these cases we can only talk about best-known clique values. Actually, further progress on these cliques was not quite expected but a new best clique for test C2000.9 recently emerged. The test gives a 2000 nodes graph with density 0.9; to the authors' knowledge the best known value for it is 78. We detected the following 79 nodes clique (nodes are numbered 0, . . . , 1999).

22, 36, 120, 137, 178, 201, 221, 222, 308, 320, 354, 367, 392, 413,
441, 455, 466, 530, 561, 577, 590, 597, 677, 681, 705, 741, 759, 823,
864, 874, 932, 950, 966, 972, 1014, 1123, 1136, 1152, 1192, 1204,
1234, 1243, 1250, 1274, 1295, 1326, 1340, 1345, 1350, 1360, 1385,
1389, 1404, 1439, 1456, 1471, 1482, 1491, 1509, 1522, 1556, 1580,
1596, 1601, 1620, 1624, 1679, 1698, 1702, 1707, 1731, 1741, 1762,
1804, 1858, 1919, 1922, 1932, 1934

The new best clique has been detected through a heuristic which is mostly based on a local search technique and priorities on nodes. Details about the approach will be given in a forthcoming paper.

Further, a longer run delivered a still larger 80-nodes clique.

6, 18, 54, 101, 109, 113, 123, 168, 198, 211, 247, 262, 325, 328, 333,
341, 386, 411, 456, 473, 520, 544, 562, 563, 589, 640, 645, 666, 677,
678, 718, 719, 733, 754, 758, 774, 792, 796, 823, 837, 866, 936, 944,
957, 972, 975, 1000, 1022, 1047, 1110, 1116, 1117, 1136, 1151, 1222,
1284, 1285, 1317, 1337, 1390, 1423, 1435, 1488, 1503, 1520, 1565,
1597, 1627, 1716, 1728, 1739, 1772, 1796, 1828, 1840, 1874, 1882,
1902, 1916, 1998.

We mention that the new approach has been tested not only on the DIMACS benchmarks but also on a new class of very challenging benchmarks used for the SAT competition 2004 (<http://www.satlive.org/SATCompetition/2004/>) For some of these benchmarks only few of the 55 SAT solvers tested in the competition were able to solve the corresponding SAT instances — hence detecting the optimal clique — and for some others even none of them reached it. Also on these benchmarks the result of our approach turned out to be particularly satisfying, being able to reach the optimal clique for one of the unsolved benchmarks and to solve other benchmarks previously solved by only few solvers. Again a complete description of the results will be given in the forthcoming paper.

REFERENCES

- [1] D. S. Johnson, M. A. Trick (eds), "Cliques, Coloring and Satisfiability: Second DIMACS Implementation Challenge.", DIMACS Series, vol. 26, American Mathematical Society.