1 Clustering problem

The Clustering problem is NP-hard [1]. It is defined as follows: There is a finite set X of objects ($|X| = N$), a distance $d(x, y) \in \mathbb{Z}_0^+$ for each pair $x, y \in X$, and two positive integers K and B. Is there a partition of X into disjoint sets $X_1, X_2, \cdots, X_K$ such that, for all pairs $x, y \in X_i$, $d(x, y) \leq B$, where $1 \leq i \leq K$?

2 Experiments

There were 12 randomly generated problem instances for the Clustering problem. Details of the generating procedure, as well as configurations, are described in the GitHub repository.[1]. Problems' specification are depicted in Table 1.

3 Results

Table 1 presents the experiment results of the Clustering problem. DLV achieved the best results in all problems. WMaxSAT was the second losing against Clingo in the first two problems only. Similarly, cmodels outperformed Clingo for larger problems but lost completly againts WMaxSAT. Eventually, smodel performed very poorly compared to other solvers.

Table 1: The Clustering problems' specification and the results. *Dec.* denotes a *decision*.

Problem	N	K	B	Dec.	Clingo	DLV	smodels	cmodels	WMaxSAT
p1	992	5	45	Yes	5.84 s	1.50 s	TL	7.20 s	5.03 s
p2	992	5	44	No	5.91 s	1.66 s	TL	8.35 s	5.22 s
p3	1271	5	49	Yes	11.27 s	2.31 s	58.12 s	9.43 s	6.42 s
p4	1271	5	48	No	11.17 s	2.41 s	TL	10.73 s	6.74 s
p5	1401	5	43	Yes	15.23 s	2.90 s	TL	15.93 s	9.18 s
p6	1401	5	42	No	15.39 s	3.24 s	TL	18.33 s	9.66 s
p7	1887	4	55	Yes	31.40 s	4.86 s	172.54 s	19.64 s	9.30 s
p8	1887	4	54	No	31.55 s	4.92 s	TL	20.73 s	9.68 s
p9	2223	4	57	Yes	51.26 s	6.75 s	224.80 s	24.74 s	11.56 s
p10	2223	4	56	No	51.98 s	6.91 s	TL	26.99 s	12.19 s

References

[1] Peter Brucker. On the complexity of clustering problems. In *Optimization and Operations Research: Proceedings of a Workshop Held at the University of Bonn, October 2–8, 1977*, pages 45–54. Springer, 1978.

[1] https://github.com/lazarow/ASP-via-WMaxSat/tree/master/clustering