Explaining the Inverse Constraint using Dulmage Mendelsohn Decomposition

Propagators for Constraint Programming

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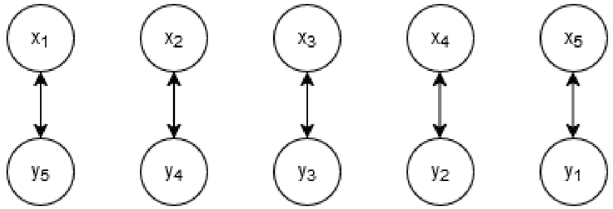
1. Inverse Constraint:

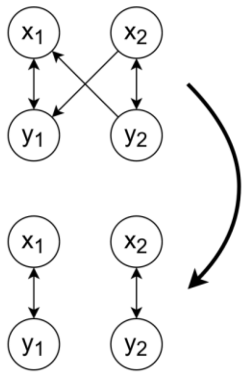
- Perfect matching of two sets



2. Arc Consistency:

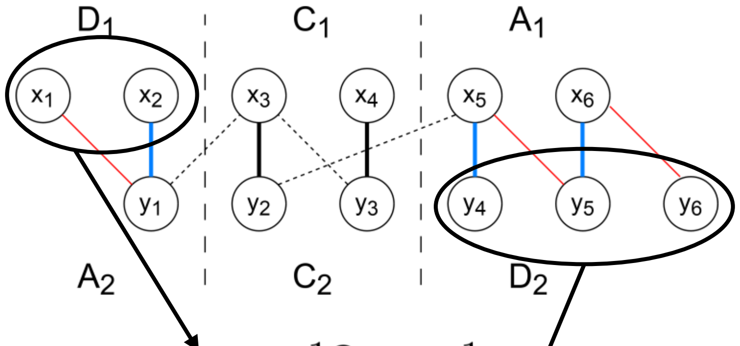
$D(x_1) = \{1\}$
$D(x_2) = \{1, 2\}$
$D(y_1) = \{1\}$
$D(y_2) = \{1, 2\}$

$D(x_1) = \{1\}$
$D(x_2) = \{2\}$
$D(y_1) = \{1\}$
$D(y_2) = \{2\}$



Research question:
To what extent can the use of Dulmage-Mendelsohn decomposition enhance the computational efficiency of propagating the inverse constraint in LCG solvers compared to decomposition methods?

3. Dulmage Mendelsohn Decomposition No-Good Generation:



$$x_1 = 1 \cap x_2 = 1$$

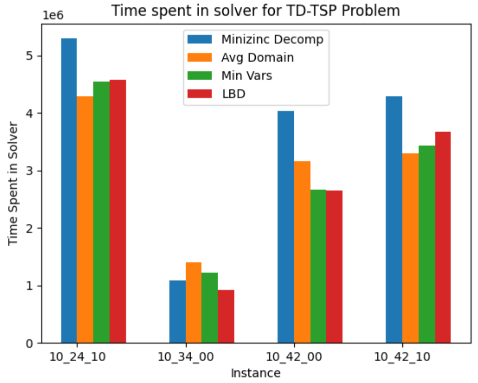
or

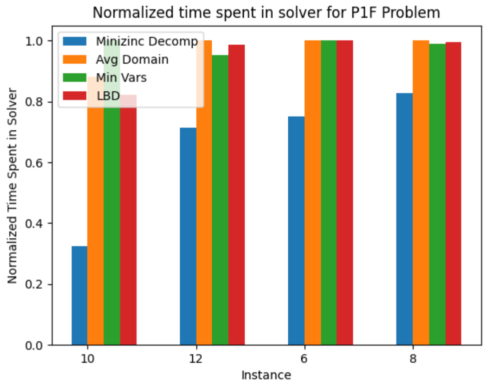
$$y_4 = 5 \cap y_5 \geq 5 \cap y_5 \leq 6 \cap y_6 = 6$$

Heuristics for no-good selection:

- Minimum number of variables
- Highest average domain size
- Minimum LBD

4. Results:





5. Conclusions and Future Work:

- Promising new explanation for no good
- LBD marginally more effective than other heuristics
- Ineffective for symmetric application of the constraint
- Implementation could be further optimized
- Combined with other techniques for symmetric applications