Alma Mater Studiorum
University of Bologna

Combinatorial Decision Making and Optimization

Report SMT Model

Dicosola Alessandro [Matr. 935563]

Model

The model use the same encoding as CP: X and Y as decision variables. In order to take into account the rotation also Wi and Hi are used for constraning the width and height of each rectangle:

```
X = IntVector("x",N)
Y = IntVector("y",N)
Wi = IntVector("w",N)
Hi = IntVector("h",N)
```

The constraints used are:

- Initialize w_i,h_i for each rectangle
  $\bigwedge_{i=1}^{N} w_i = W_i \wedge h_i = H_i \vee h_i = W_i \wedge w_i = H_i$
- X and Y should be bounded within the "available" area given their size
  $\bigwedge_{i=1}^{N} x_i >= 0 \wedge x_i <= W - w_i \wedge y_i >= 0 \wedge y_i <= H - h_i$
- No overlapping constraint:

  Two rectangles i ad j overlap if: $x_i + w_i > x_j \wedge x_i < x_j + w_j \wedge y_i + h_i > y_j \wedge y_i < y_j + h_j$ thus negating it we have the no-overlap constraint:
  $\bigwedge_{i=1}^{N} x_i + w_i \leq x_j \vee x_j + w_j \leq x_i \vee y_i + h_i \leq y_j \vee y_j + h_j \leq y_i$
- In case of rectangles with same size I' ve created the **lex_lesseq** constraint decomposing it.
- The implicit constraint: given a vertical (resp. horizontal) line the sum of each vertical (resp. horizontal) edge is H (resp. W).

Both **rotation** and **rectangles with same size** are handled althought for the latter case when there aren't rectangles with same size *unsat* is returned thus this constraint is activated only manually by command line.