A first feedback on
Set Packing Problems with two objectives

Xavier GANDIBLEUX
LAMIH- UMR CNRS 8530, Université de Valenciennes
''Le Mont Houy'', F-59313 Valenciennes cedex 9, France
Xavier.Gandibleux@univ-valenciennes.fr

Fabien DEGOUTIN
INRETS/ESTAS
20, rue Elisée Reclus, F-59650 Villeneuve d'Ascq, France
Fabien.Degoutin@inrets.fr

Xavier DELORME
INRETS/ESTAS
20, rue Elisée Reclus, F-59650 Villeneuve d'Ascq, France
Xavier.Delorme@inrets.fr

Set Packing Problems, CPLEX and bounds

$$\begin{bmatrix} \text{"max"} & Cx \\ \text{subject to} & Ax \leq 1 \\ & x = (0,1) \end{bmatrix}$$
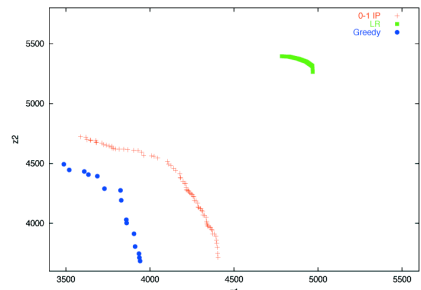
BiSPP
- $\mathcal{NP}$-Hard
- E = SE U NE
- no previous work

114 Instances
- 6 sets of objective functions
- #variables : 100 & 200
- #constraints : 300 ... 1000

Questions
- Bounds?
- Exact resolution?
- Metaheuristic?

- LBS : a greedy algorithm
- E   : CPLEX(01)
- UBS : CPLEX(LP)
- CPU time : up to 130 000 s

SPEA and BiSPP

Background
- SPEA : evolutionnary Algorithm with Pareto-based fitness assignment
- SPP : a particular case of the Multi-Knapsack Problem (MKP)
- SPEA presents good results on the multiobjective multi-knapsack [Zitzler 1999]

SPEA on Bi-SPP :
- Initial population of 50 individuals
- Crossover rate 0.8
- One-point crossover
- Mutation rate 0.04
- Repair function
- Saturation function
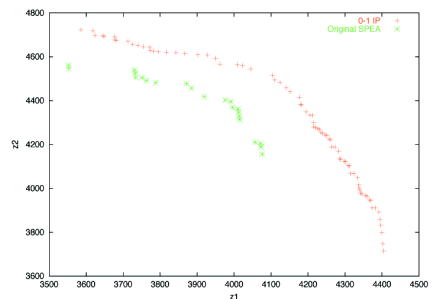
- Does not cover all the efficient frontier
- Distant from the efficient frontier
- Holes
- CPU time : up to 10 s

Modifications on and around SPEA
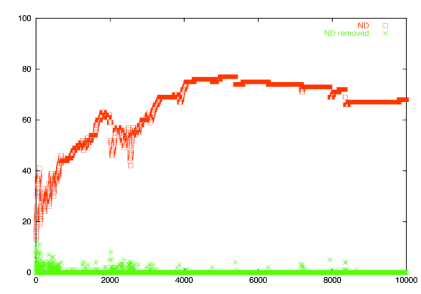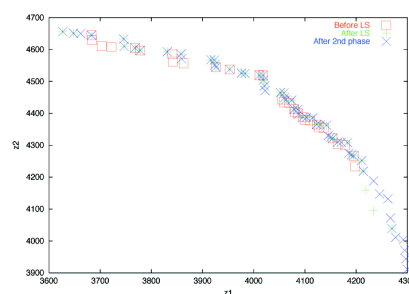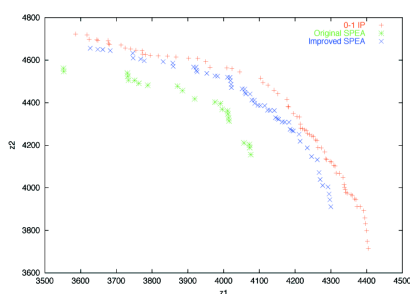
- Keep all potential E generated by recombination
- 3 directions of saturation
- 1-1 LS strategy over compromize solutions
- 1-1 agressive LS strategy over extreme solutions
- 2 sequential phases of couple generation//LS

- Uniformity : better distribution along the efficient frontier
- Distance : shorter distance from the efficient frontier
- Detection : more exact efficient solutions generated
- CPU time : 15 * CPUt of original SPEA (up to 150 s)
- A perspective : stopping criterion