



International Configuration Workshop Vienna – September 2015

Towards a Benchmark for Configuration and Planning Optimization Problems

L.Garcés – P.Pitiot – M.Aldanondo – E.Vareilles



**TOULOUSE UNIVERSITY – MINES ALBI
3IL-CCI RODEZ, FRANCE**



Overview

1. Introduction

2. Concurrent Problem

3. Meta Model

4. Structural Analysis

5. Conclusion

Introduction

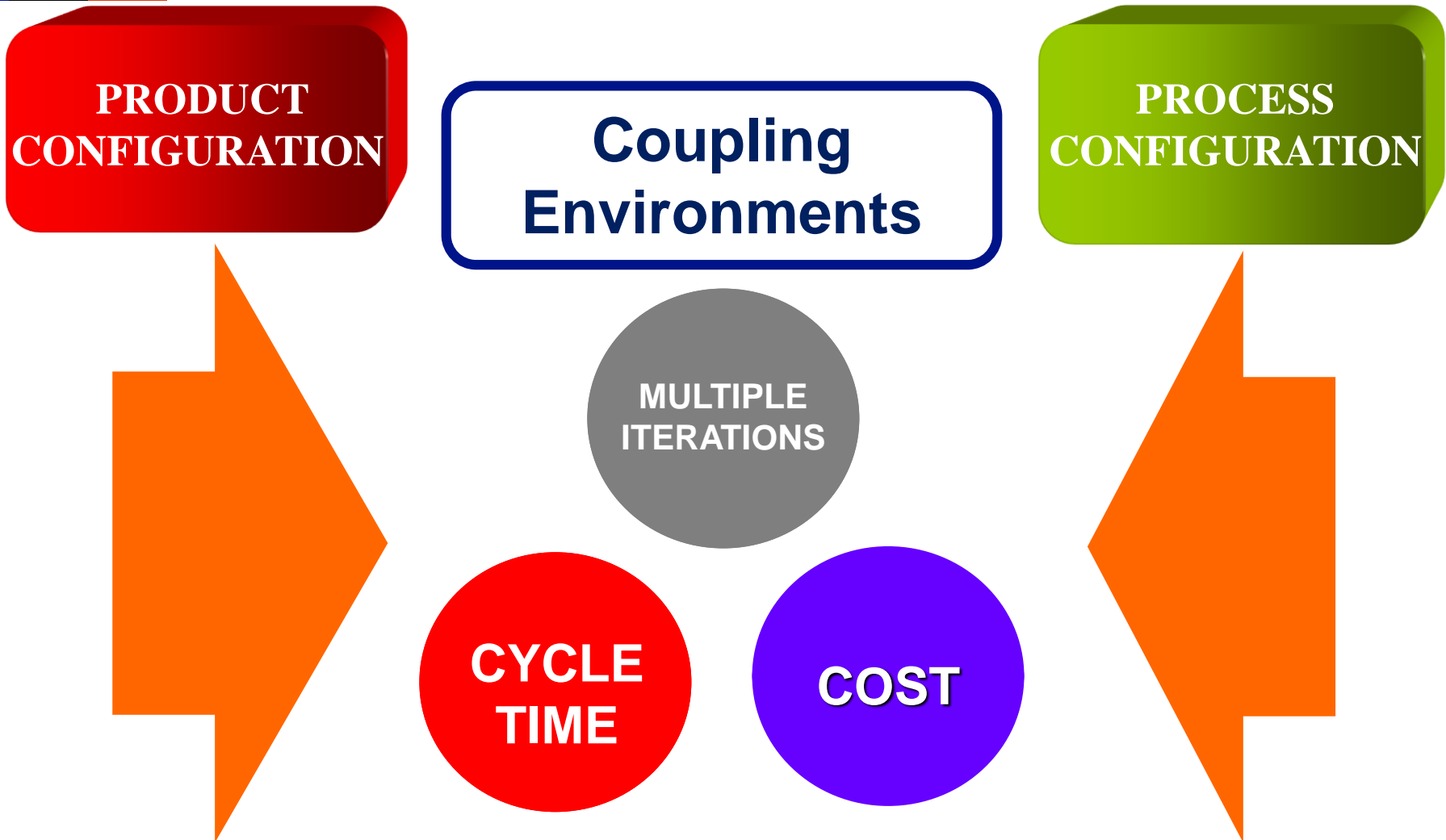


SOME OF THEM CONCURRENT OF PRODUCT/PROCESS

SOME OF THEM DEAL WITH OPTIMIZATION

BUT MOST OF THEM CASE DEPENDANT

Concurrent Problem





Objective

Propose a benchmark
for a specific optimization problem
of concurrent configuration of product and
process

Inspire on:

- ☐ Academic Optimization Benchmark
- ☐ Industrial Real Cases

Concurrent Configuration of Product and Process

CONSTRAINT SATISFACTION PROBLEM

PRODUCT and PROCESS CHARACTERISTICS
COSTUMER REQUIREMENTS

PRODUCT

- Definition of a Customized Product.
- Set of Properties and sub-assemblies
- Bill of Materials

PROCESS

- Definition of a Specific Production Process
- Set o production operations
- Resources to be used

Meta Model Description of the problem

V

V is the set of variables

D

D is the set of domains linked to the V

C

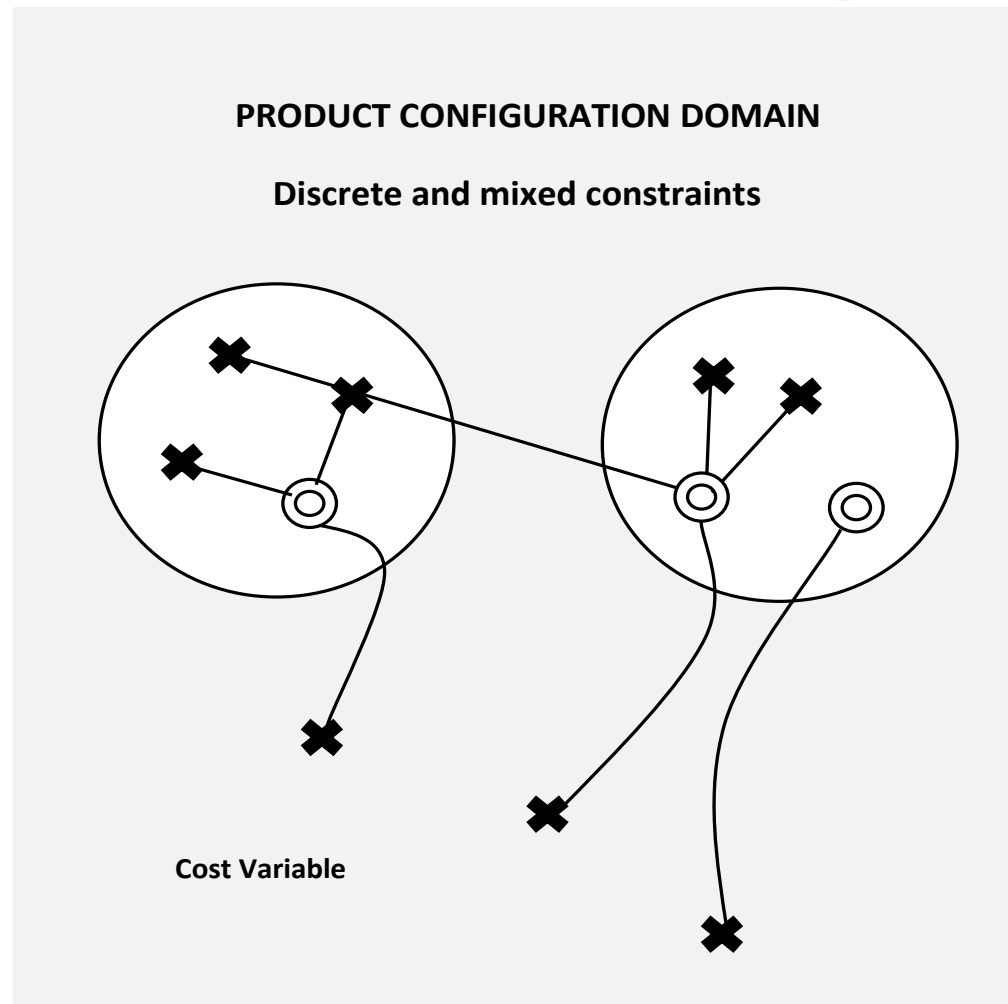
C is the set of constraints on variables of V

f

f is the multivalued fitness function

=> Constraint Optimization Problem (O-CSP)

Meta Model Description



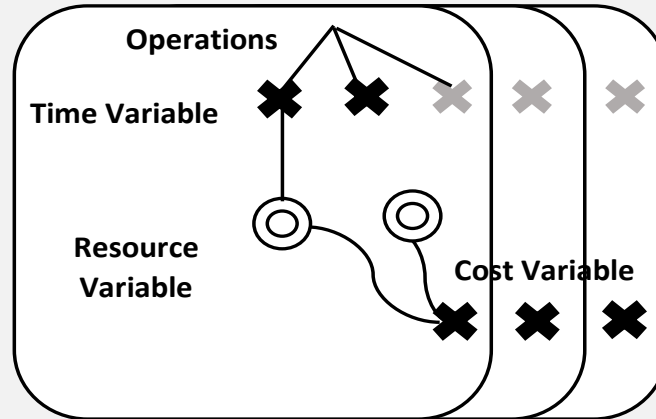
✖ Descriptive Variable (discrete or continuous)

⊙ Decision Variable

Meta Model Description

PLANNING PROCESS DOMAIN

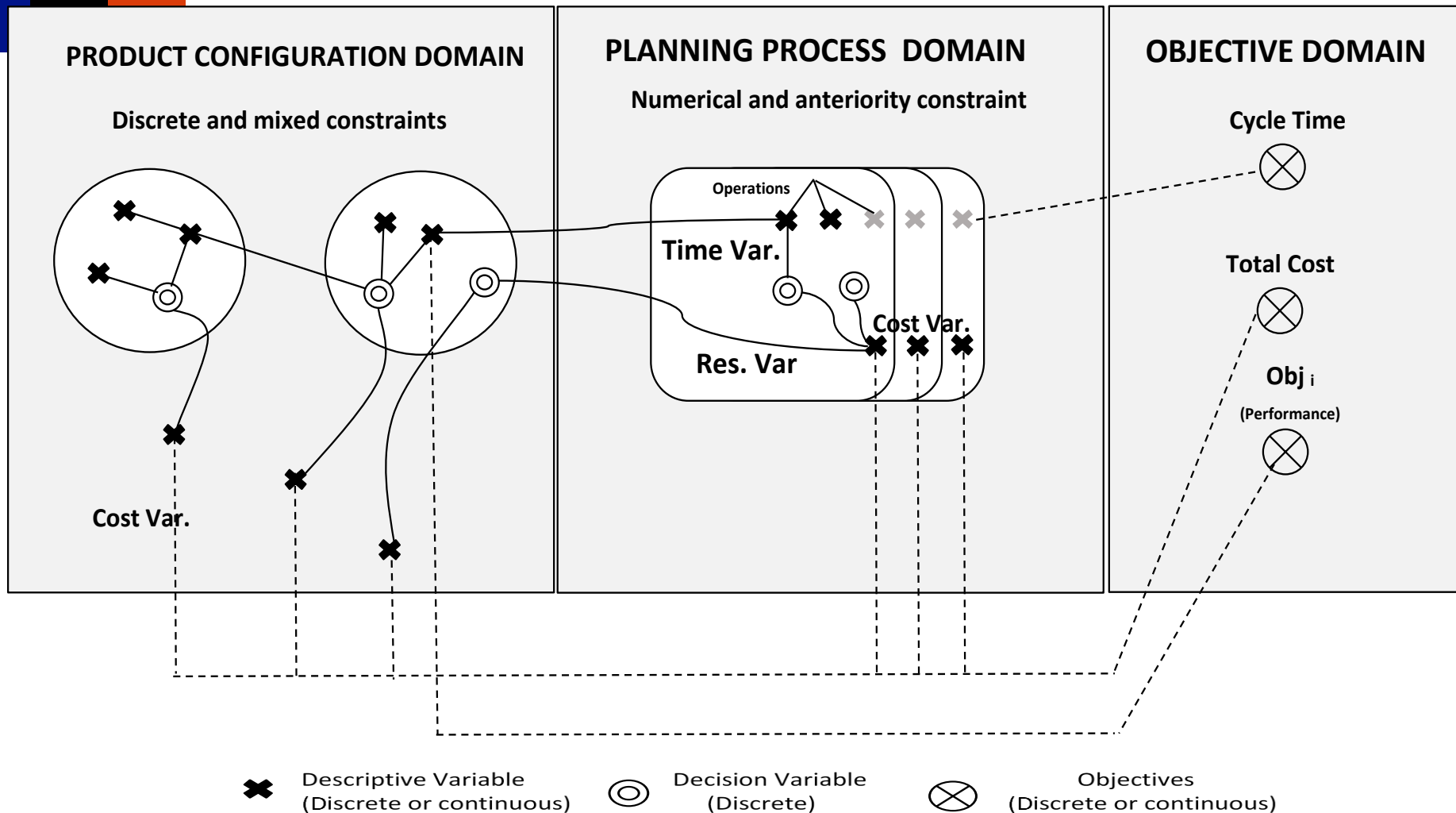
Numerical and anteriority constraint



✖ Descriptive Variable (discrete or continuous)

⊙ Decision Variable

Meta Model Description



Structural Analysis

VARIABLES

1. NUMBER OF VARIABLES

3. TYPE

- Decision Variable
- Intermediate Variable
- Objective Variable

2. NATURE

- Discrete
- Continuous

4. DOMAIN

- Product
- Process
- Objective

Structural Analysis

CONSTRAINTS

1. NUMBER OF CONSTRAINTS

2. NATURE

- Compatibility Table
 - Math Formula
- Density of Constraints
Pattern



3. DOMAIN

- Product-Product
- Process-Process
- Product-Process
- Product-Objective
- Process-Objective



Characterization of Problem Constraint Pattern

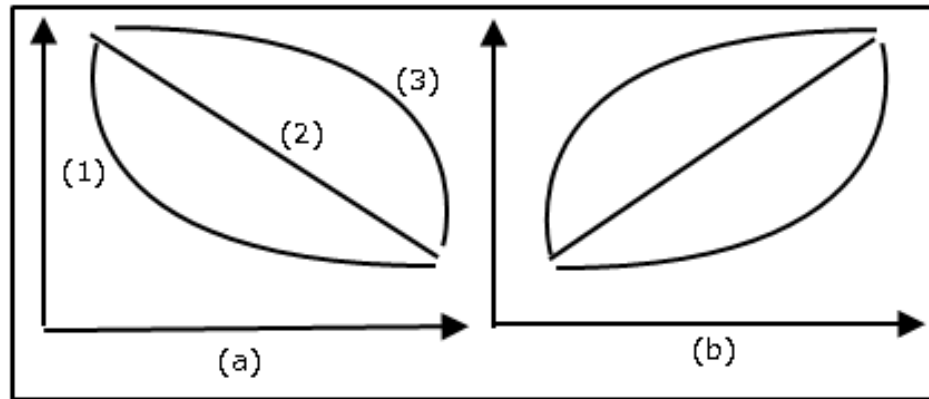
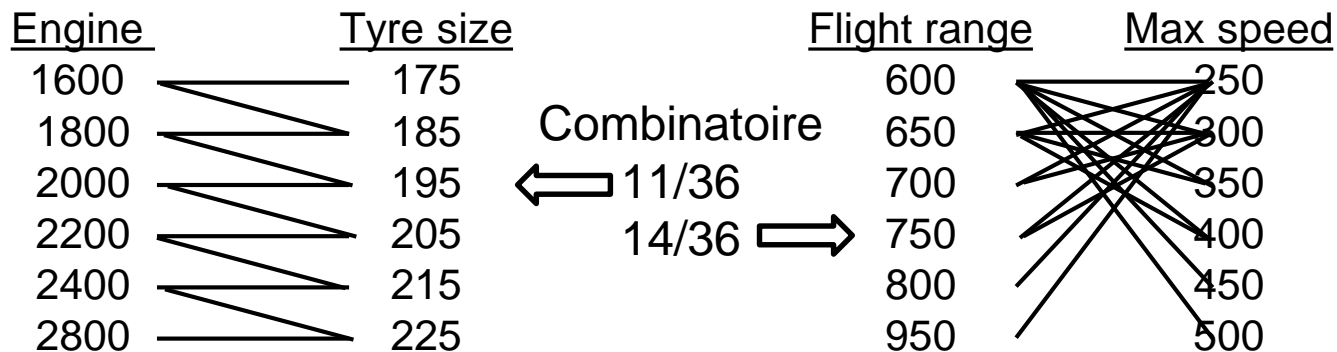


Figure 2 – Negative (a) and positive (b) correlations with three possible case: (1) reducer, (2) linear, (3) amplifier.



Conclusion



- ❑ There is no standard or benchmark for a concurrent model.
- ❑ First elements of a meta model for concurrent product and process configuration .



Thanks





COMPATIBILITY TABLE

Cs1 (C-Seats, Seats)

Cost Seats	Quantity of Seats
90	4
120	6

FUNCTION

Function	Equation
F1	Global Cost = C-Seats+C-Range+C-Source+C-Assembling
F2	Cycle Time = D-Source+D-Assembling