PASI 2011 | Process Modeling and Optimization for Energy and Sustainability

July 19-29, 2011, Angra dos Reis, RJ, Brazil

Group 1

Coach
Prof. **Wayne Bequette**

Hector De la Hoz
(NLMPC, Microalgae)

Hector Puebla
(Analysis & Control)

Mariano Martin
(Optimization Biofuels)

David Arana
(Modeling & Simulation)

Zhao, Yao
(Verified dynamic Opt.)

Paula Staudt
(Modeling & Simulation)

Marcelo Escobar
(Energy integration & Control)

Vanina Cafaro
(Pipeline Scheduling)

Optimal Sustainable Learning (OSL)

Problem Statement:

Given are: a Number of Students and Professors;

Goal: Minimize Energy Cost and CO_2 emission while maximize Student Learning and Satisfaction and Professor Happiness

Mathematical Formulation:

$$\$ = f(Place, Distance, Transport, Weather) = aPlace^{\alpha} + bDistance^{\beta} + \sum_i (cont_i + Distance_i) Transport_i + Sun$$

$$StSat = \sum_{i=Students} f(N_{Lectures}, N_{Seminars}, t_{class}, Food, Drinks, t_{free}, Sun, Beach) = \sum_i \frac{aFood + bDrinks + t_{free}}{1 + t_{class}(N_{Lectures} + N_{Seminars})} + Beach^{Sun}$$

$$Sun = f(\text{Meteorological model})$$

$$\text{Place} \Rightarrow \text{Beach=Allocation problem}$$

$$\text{Pr}ofHappiness = \sum_{j=Professors} f(N_{Lectures}, N_{Seminars}, t_{class}, t_{free}, Sun) = \sum_i \frac{1 + t_{class}(N_{Lectures} + N_{Seminars})}{t_{free}} + Beach^{Sun}$$

Problem Statistics: *j=21 Professor i=64 Students*

Group 1

The Issue: The problem is highly **non linear** and **non convex** involving **integer decisions** and **uncertainty** – **NP Hard!!!**

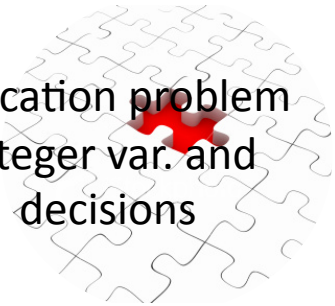
Background

Process Synthesis
El-Halwagi, Grossmann, Maravelias

Optimization Tools
Biegler, Diaz

Tools

Allocation problem
Integer var. and decisions



Parameter estimation
Non linear constraints
System dynamics

Basis

Modeling, Simulation & Optimization
Secchi, Reed

Process Control
Bequette

Knowledge, Learnings

Group 1

After PASI we have…

- *Learned interesting subjects*
- *Established contacts with colleagues with common research interests and important researchers*
- *Identified open problems, challenges, tools and potential applications in PSE*

For the next PASI we suggest…

- *More interactive activities (Happy hour)*
- *More hands on work*
- *Short open problem competition*

Group 1

Group 1