

Report on the Faculty Exchange Program CMU-Portugal – Spring 2014

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The visit to Carnegie Mellon and, in particular, the research group of Professor Ignacio E. Grossmann was a great opportunity to grasp the best practices of a top research group and understand the key drivers necessary to achieve such success. While part of this group I was able to contact with several PhD and Post-Doc researchers as well as other Professors from the Process Systems Engineering Research Group.

In terms of research this visit was very productive as we were able to work on a paper that addresses an integrated framework for deciding about the supplier selection for supply chains in the processed food industry. The relevance of including tactical production and distribution planning in this procurement decision was assessed. We were especially concerned with the option of branding a product as local or mainstream. We proposed a new two-stage stochastic mixed-integer programming model for the supplier selection in the process food industry that maximizes profit and minimizes risk of low customer service. Moreover, we are developing a solution method based on multi-cut benders decomposition. To improve the performance of this traditional solution method we have implemented several acceleration techniques. Namely, we have used the hull reformulation of the master constraints coming from a generalized disjunctive program of this problem to tighten it; we have implemented a convex combination procedure of the solutions found throughout the search to provide better new cuts and we have developed a scheme in which the master problem is only solved once and the Benders cuts are generated throughout the branch-and-bound search using callbacks. The computational experiments resulting from these implementations are revealing an improved performance over traditional state-of-the-art solvers, such as Cplex.

Additionally, in the first part of the visit I was able to audit two courses: Integer Programming and Advanced Process Systems Engineering from Tepper School of Business and Chemical Engineering Department, respectively. This enabled me to understand the main pedagogical methodologies and learn the best teaching practices used at Carnegie Mellon.

Finally, during my stay I gave two seminars about “Risk Management in Production Planning of Perishable Food Goods”. The first seminar was given to the Process Systems Engineering Research Group and the second one was given in a series of seminars called Enterprise-wide Optimization Seminars (<http://egon.cheme.cmu.edu/ewocp/>). Attending to these seminars are researchers from companies, such as British Petrol, ExxonMobil, Total, P&G and Unilever.

Now back in Porto, the goal is to incorporate some of the best practices that I found interesting over there. For example, having a weekly meeting of one hour with all PhD students to discuss the ongoing work. Furthermore, I hope that this research collaboration can expand to my PhD

students and that they are able to stay for a period of time at CMU. To foster these ideas, Professor Ignacio E. Grossmann is coming to Porto for a short visit by the beginning of the New Year.

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