The Hybrid Proximal Decomposition Method Applied to the Computation of a Nash Equillibrium for Hydrothermal Electricity Markets*

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The deregulation in electricity production markets occurred in the last century in the USA and extended thereafter (in some different degrees) to most of the countries, thoroughly changed the behavior of the electricity production companies and accordingly, the computation of the price of electricity provided by these companies.

In this work we present a model for the optimal scheduling of hydraulic and thermal electricity generation units based on Nash-Cournot equilibrium theory. We also assume that the hydraulic units have the ability of pumping water back in order to reuse it. This last assumption introduces non-differentiability in the formulation, but the presented numerical algorithm is able to deal with it.

The mathematical conditions of the Nash-Cournot equilibrium are stated in terms of a variational inclusion of the form $0 \in T(x)$, where T is a maximal monotone operator that has certain special structure suitable for applying the decomposition method presented in [2]. In fact, to enhance numerical efficiency, we apply the variable metric version of this algorithm presented in [1].

We further illustrate the application of the VMHPDM method in four examples and present the obtained numerical results.

References

[1] P.A. Lotito, L.A. Parente and M.V. Solodov. A class of variable metric decomposition methods for monotone variational inclusions (2008). *Available at* `http://www.impa.br/~optim/solodov.html`.

[2] M.V. Solodov. A class of decomposition methods for convex optimization and monotone variational inclusions via the hybrid inexact proximal point framework. *Optimization Methods and Software*, 19, pp. 557–575, (2004).

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