When Augmented Lagrangian Methods, edited by M. Fortin and R. Glowinski, appeared in 1983, the authors of the present book quickly realized that a sequel was needed for a variety of reasons, including the emergence of new applications and the sophistication of existing ones; a deeper understanding of the convergence properties of augmented Lagrangian algorithms and of their relationship to operator-splitting methods such as alternating-direction methods; and the development of more efficient ...
Augmented Lagrangian and Operator Splitting Methods in Nonlinear Mechanics

This volume deals with the numerical simulation of the behavior of continuous media by augmented Lagrangian and operator-splitting methods (coupled to finite-element approximations). It begins with a description of the mechanical and mathematical frameworks of the considered applications as well as a general analysis of the basic numerical methods additionally used to study them.

Augmented Lagrangian and Operator Splitting Methods in Nonlinear Mechanics

A need for a deeper understanding of the convergence properties of augmented Lagrangian algorithms and of their relationship to operator-splitting methods such as alternating-direction methods prompted the authors to write this book.

Augmented Lagrangian and Operator Splitting Methods in Nonlinear Mechanics

Augmented Lagrangian and Operator Splitting AUGMENTED LAGRANGIAN METHOD, DUAL METHODS, AND … Augmented Lagrangian Method, Dual Methods, and Split Bregman Iteration

Using the inner products of V and Q, we can find the adjoint operator of r, i.e., the discrete divergence operator \( \text{div} : Q \rightarrow \mathbb{R} \). Frank-Wolfe Splitting via Augmented Lagrangian Method

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At each iteration, the algorithm, also known as a two-splitting scheme, minimizes the dual augmented Lagrangian function sequentially with respect to the Lagrange multipliers corresponding to the linear constraints, then the dual slack variables and finally the primal variables, while in each minimization keeping the other variables fixed.

Le Tallec, Augmented Lagrangian and operator-splitting...

Augmented Lagrangian methods are a certain class of algorithms for solving constrained optimization problems. They have similarities to penalty methods in that they replace a constrained optimization problem by a series of unconstrained problems and add a penalty term to the objective; the difference is that the augmented Lagrangian method adds yet another term, designed to mimic a Lagrange multiplier. The augmented Lagrangian is related to, but not identical with the method of Lagrange multipliers.

Augmented Lagrangian method - Wikipedia

Augmented Lagrangian Methods. With \( f \) proper, lower semi-continuous, and convex, consider:

\[
\min f(x) \text{ s.t. } Ax = b;
\]

The augmented Lagrangian is (with \( \hat{\lambda} > 0 \))

\[
L(x; \lambda; \hat{\lambda}) := f(x) + \lambda^T (Ax - b) + \frac{\hat{\lambda}}{2} ||Ax - b||^2 \quad \text{Basicaugmented Lagrangian(a.k.a. method of multipliers) is } x. \]

k= arg min. x. L(x; .)
The resulting unconstrained problem is then transformed into a different constrained problem, by the application of a variable splitting operation; finally, the obtained constrained problem is attacked with an augmented Lagrangian (AL) scheme, which is a variant of the ADMM.

This line of research, which could be called augmented Lagrangian–based splitting algorithms, has gained much attention from the community. Particularly, the mentioned ADMM originally proposed in Glowinski & Marrocco (1975) is such a case for \( m=2 \) and the primal subproblem in (5.4) is decomposed in the Gauss–Seidel manner.

This is the inexact parallel splitting augmented Lagrangian method (abbreviate to in-PSALM). This method has the following advantages: it decomposes the cost of computational loads to each of the processors which participate in solving the problem and at the same time it can avoid the inverse matrix operator such that the complexity of each iteration is \( O(n^2) \) in theory and in practice.

Following the recent work Schaeffer and Osher (SIAM J Imaging Sci 6:226–262, 2013), the low patch-rank interpretation for the oscillating patterns of an image validates the application of matrix-rank optimization to image decomposition. Therein, the problem was mathematically modeled as a separable convex programming with three-block (a total variation semi-norm for regularizing the cartoon component, etc.).
problems, and first- and second-order conditions for the existence of augmented Lagrange multipliers are presented. The analysis is based on the reformulation of the augmented Lagrangian in terms of the Moreau envelope functions and the technique of epi-convergence via the calculation of second-order epi ...