Dualization of Signal Recovery Problems

Combettes P.L., Dung D., Vu B.C.
Laboratoire Jacques-Louis Lions-UMR 7598, UPMC Université Paris 06, Paris, 75005, France; Information Technology Institute, Vietnam National University, Hanoi, Viet Nam

Abstract: In convex optimization, duality theory can sometimes lead to simpler solution methods than those resulting from direct primal analysis. In this paper, this principle is applied to a class of composite variational problems arising in particular in signal recovery. These problems are not easily amenable to solution by current methods but they feature Fenchel-Moreau-Rockafellar dual problems that can be solved by forward-backward splitting. The proposed algorithm produces simultaneously a sequence converging weakly to a dual solution, and a sequence converging strongly to the primal solution. Our framework is shown to capture and extend several existing duality-based signal recovery methods and to be applicable to a variety of new problems beyond their scope. © 2010 Springer Science+Business Media B.V.
Author Keywords: Convex optimization; Denoising; Dictionary; Duality; Dykstra-like algorithm; Forward-backward splitting; Image reconstruction; Image restoration; Inverse problem; Primal-dual algorithm; Proximity operator; Signal recovery; Total variation

Year: 2010
Source title: Set-Valued and Variational Analysis
Page : 1-32
Link: Scorpus Link
Correspondence Address: Combettes, P.L.; Laboratoire Jacques-Louis Lions-UMR 7598, UPMC Université Paris 06, Paris, 75005, France; email: plc@math.jussieu.fr
ISSN: 18770533
DOI: 10.1007/s11228-010-0147-7
Language of Original Document: English
Abbreviated Source Title: Set-Valued and Variational Analysis
Document Type: Article in Press
Source: Scopus
Authors with affiliations:

- Combettes, P.L., Laboratoire Jacques-Louis Lions-UMR 7598, UPMC Université Paris 06, Paris, 75005, France
- Dũng, D., Information Technology Institute, Vietnam National University, Hanoi, Viet Nam
- Vũ, B.C., Laboratoire Jacques-Louis Lions-UMR 7598, UPMC Université Paris 06, Paris, 75005, France