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Uniformly monotone operators and their reflected resolvents

The correspondence between the class of nonexpansive mappings and the class of maximally monotone operators via the reflected resolvents of the latter played an instrumental role in the convergence analysis of the splitting methods. Indeed, the performance of some of these methods hinges on iterating the so-called splitting operators associated with the individual operators. These splitting operators in the case of Douglas–Rachford and Peaceman–Rachford methods are functions of the composition of the reflected resolvents of the underlying operators. In this talk, we provide a comprehensive study of the reflected resolvents of uniformly monotone operators. We show that this class is closely related to the class of the strongly nonexpansive operators introduced by Bruck and Reich. Connection to duality via the inverse operators is systematically studied. We provide applications to Douglas–Rachford and Peaceman–Rachford methods. Examples that illustrate and tighten our results are presented. (Based on joint work with L. Liu and J. Venderwerff.)