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On Borwein–Wiersma Decompositions of Monotone Linear Relations

Monotone operators play fundamental roles in optimization. In 1970, Asplund studied irreducible decompositions of a monotone mapping as the sum of a subdifferential mapping and an “irreducible” monotone mapping. In 2007, Borwein and Wiersma introduced skew decompositions of a monotone mapping as the sum of a subdifferential mapping and a “skew” monotone mapping. These decompositions provide intrinsic insights to monotone operators, and they are variants of the well-known decomposition of a matrix into its symmetric and antisymmetric parts. In this talk, we consider the Borwein–Wiersma decomposition of a maximal monotone linear relation (e.g. its graph is linear). We give sufficient conditions and characterizations for a maximal monotone linear relation to be Borwein–Wiersma decomposable. Explicit Borwein–Wiersma decompositions of maximal monotone linear relations in Hilbert spaces are given.

This is a joint work with Heinz Bauschke and Liangjin Yao.