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Maximality of Sums of Monotone Operators

We say a multifunction $T\colon X \mapsto 2^{X^*}$ is *monotone* provided that for all $x, y \in X$, and for all $x^* \in T(x)$, $y^* \in T(y)$,

$$\langle y - x, y^* - x^* \rangle \geq 0,$$

and we say that T is *maximal monotone* if its graph is not properly included in any other monotone graph. The *convex subdifferential* in Banach space and a *skew linear matrix* are the canonical examples of maximal monotone multifunctions. Maximal monotone operators play an important role in functional analysis, optimization and partial differential equation theory, with applications in subjects such as mathematical economics and robust control.

In this talk, largely based on [1], I shall show how—thanks largely to a long-neglected observation of Fitzpatrick—the originally quite complex theory of monotone operators can be almost entirely reduced to convex analysis. I shall also highlight various long-standing open questions to which these new techniques have offered new access, [2], [3].

References

[1] J. M. Borwein, *Maximal Monotonicity via Convex Analysis.* J. Convex Analysis (special issue in memory of Simon Fitzpatrick), **13**(2006), June. [D-drive Preprint 281].

[2] ———, *Maximality of Sums of Two Maximal Monotone Operators in General Banach Space.* Proc. Amer. Math. Soc., accepted September 2006. [D-drive Preprint 322].

[3] A. E. Eberhard and J. M. Borwein, *Maximality of Monotone Operators in Banach Space.* Preprint, September 2006. [D-drive Preprint 325].