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SIGNAL PROCESSING APPLICATIONS OF A PAIR OF SIMPLE FIXED POINT ALGORITHMS

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Inspired by the remarkable flexibility of the fixed point theory of (quasi-)nonexpansive mapping and its successful applications to inverse problems, we have developed a pair of extremely simple algorithms and have shown their effectiveness in many signal processing applications. The *hybrid steepest descent method* [1] can approximate iteratively the solution of the variational inequality problem formulated over the fixed point set of (quasi-)nonexpansive mapping in a real Hilbert space $\mathcal{H}$, hence realizes simple computational schemes for a certain *hierarchical constrained optimization problem* : given a pair of convex cost functions $f_i : \mathcal{H} \to \mathbb{R}$ $(i = 1, 2)$ and a closed convex set $C_1 \subset \mathcal{H}$, minimize f_2 over $C_2 := \arg\min_{x \in C_1} f_1(x) \neq \emptyset$. The *adaptive projected subgradient method* [2] minimize asymptotically *a certain sequence of nonnegative convex functions* over a closed convex set in $\mathcal{H}$. This algorithm offers a unified mathematical foundation of not only a wide range of the *projection based adaptive filtering algorithms* but also a powerful online classification algorithm.
In this talk, we introduce recent signal processing applications of these algorithms.

References

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[2] I. Yamada, and N. Ogura, Adaptive projected subgradient method for asymptotic minimization of sequence of nonnegative convex functions, *Numerical Functional Analysis and Optimization*, **25**, (2004), pp.593-617.