962-65-783 **Isao Yamada** (isao@ss.titech.ac.jp), Dept. of Communications and Integrated Systems, Tokyo Institute of Technology Ookayama Meguro-ku Tokyo 152-8552 JAPAN. *Hybrid steepest descent method and its application to convexly constrained inverse problems.* Preliminary report.

The *hybrid steepest descent method* is an algorithmic solution to the variational inequality problem defined over the fixed point sets of nonexpansive mappings in a real Hilbert space $\mathcal{H}$. One of its central results is summarized as follows. Suppose that $T : \mathcal{H} \to \mathcal{H}$ is nonexpansive and the derivative Θ', of a convex function $\Theta : \mathcal{H} \to \mathbb{R} \cup \{\infty\}$, is κ-Lipschitzian and η-strongly monotone over $T(\mathcal{H})$. Then the sequence (u_n) generated by $u_{n+1} := T(u_n) - \lambda_{n+1}\mu\Theta'(T(u_n))$ [for $\mu \in (0, \frac{2\eta}{\kappa^2})$] converges strongly to the unique minimizer of Θ over $Fix(T)$ when $\lambda_n \in [0,1]$ $(n = 1, 2, \cdots)$ satisfies (i) $\lim_{n\to+\infty} \lambda_n = 0$, (ii) $\sum_{n\geq 1} \lambda_n = +\infty$, and (iii) $\sum_{n\geq 1} |\lambda_n - \lambda_{n+1}| < +\infty$. Remarkably wide applications of the method are realized in particular to the convexly constrained inverse problems as well as to the (possibly inconsistent) convex feasibility problems. By focusing on an *asymptotically shrinking nonexpansive mapping* $T : \mathcal{H} \to \mathcal{H}$ satisfying $\sup_{\|x\|\geq R} \frac{\|T(x)\|}{\|x\|} < 1$ for some $R > 0$, whose fixed point set $Fix(T)$ is specially crucial to characterize the solution sets of many convexly constrained inverse problems, the above condition imposed on the cost function Θ can be relaxed as follows. Suppose that $\mathcal{H}$ is finite dimensional and $T : \mathcal{H} \to \mathcal{H}$ is *asymptotically shrinking* as well as *attracting nonexpansive*. Suppose also that the derivative Θ', of a convex function $\Theta : \mathcal{H} \to \mathbb{R} \cup \{\infty\}$, is κ-Lipschitzian over $T(\mathcal{H})$. Then the sequence (u_n), generated by $u_{n+1} := T(u_n) - \lambda_{n+1}\Theta'(T(u_n))$ with any positive sequence $(\lambda_n)_{n=1}^{\infty} \in l^2 \cap (l^1)^C$, satisfies $\lim_{n\to\infty} d(u_n, \Gamma) = 0$, where $\Gamma := \{u \in Fix(T) \mid \Theta(u) = \inf \Theta(Fix(T))\} \neq \emptyset$. (Received September 26, 2000)