ICM 1998, Berlin, Aug. 18–27

Abstracts of Short Communications and Posters

Section:

17. Control Theory and Optimization

1991 MS Classification: 49, 90, 93

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Global Optimality Conditions for some class of Nonconvex Optimization Problems

Global optimality conditions for the problems of minimizing and maximizing a quasiconvex function over arbitrary sets have been considered.

$f(x) \quad \longrightarrow \quad \max(min) \ , \quad x \in D \subset R^n \ ,$ (1)((2))

Theorem 1. Let z be a solution of problem (1). Then the following condition holds: $\langle f'(y), x-y \rangle \leq 0 \ , \quad \forall x \in D \ , \ \forall y \in R^n : \ f(y) = f(z)$.

If, in addition, $f'(y) \neq 0$, $\forall y \in R^n : \ f(y) = f(z)$ then this condition becomes sufficient for problem (1).

Theorem 2. If $z \in D$ is a solution of problem (2), then the following condition holds: $\langle f'(x), x-y \rangle \geq 0 \ , \quad \forall x \in D \ , \ \forall y : \ f(y) = f(z)$.

If, in addition, $\inf\limits_{x \in D} ||f'(x+\alpha f'(x))|| \neq 0 \ , \ \alpha \geq 0$ then this condition becomes sufficient for (2).