On the Line Search Method for Quasi-Differentiable Optimization Problem

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i) To present a method of realizing the theoretical results of Demyanov in practice, i.e. on a computer in order to produce a kind of constructive evidence for his theory and, in addition, a practical method of getting numerical results for quasi-differentiable optimization problem which may arise in industry and science, we consider in this paper the line search method for optimizing the following quasi-differentiable optimization problem under constraints:

$$\text{Min} \quad f(x)\ ,\ x \in R_n$$

$$\text{st} \quad h_i(x) \ \leq \ 0\ , \quad i = 1,2,\ldots,m$$

where the function f: $R_n \rightarrow R$, and $h_i(x)$: $R_n \rightarrow R$ are quasi-differentiable functions.

ii) In order to find the solution to a quasi-differentiable optimization problem, we introduce a modified gradient method, because it seems to be the most general and exact theory and has many advantages over the their methods. A gradient method method for the solution of quasi-differentiable optimization problem is a iterative algorithm to minimize a function f: $R_n \rightarrow R$, which creates a converging sequence $(x_k) \in R_n$, where

$$\lim \ \inf \{ f(x_k) \} = \inf \{ f(x) \}.$$

iii) The principle of these algorithms consists on constructing x_{k+1} from x_k in two step:

a) choose a direction g_k , where the objective function decreases.

b) choose a stepwise $\alpha_k \in R$ such that x_{k+1} can be computed by:

$$x_{k+1} = x_k + \alpha_k . g_k$$

Based on the determination of a direction g_k in quasi-differentiable optimization problem, we examine α_k by several line search methods, and then suggest approximation methods for quasi-differentiable optimization problem under constraints.