Optimality Conditions for Weak Efficient Solutions Generated by a Set Q in Vector Spaces

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Abstract : In this paper, we first introduce a new distance function in a linear space not necessarily endowed with a topology. The algebraic concepts of interior and closure are useful to study optimization problems without topology. So, we define Q-weak efficient solutions generated by the algebraic interior of a set Q, where Q is not necessarily convex. Studying nonconvex vector optimization is valuable since, for a convex cone K in topological spaces, we have int(K)=cor(K), which means that topological interior of a convex cone K is equal to the algebraic interior of K. Moreover, we used the scalarization technique including the distance function generated by the vectorial closure of a set to characterize these Q-weak efficient solutions. Scalarization is a useful approach for solving vector optimization problems. This technique reduces the optimization problem to a scalar problem which tends to be an optimization problem with a real-valued objective function. For instance, Q-weak efficient solutions of vector optimization problems can be characterized and computed as solutions of appropriate scalar optimization problems. In the convex case, linear functionals can be used as objective functionals of the scalar problems. But in the nonconvex case, we should present a suitable objective function. It is the aim of this paper to present a new distance function that be useful to obtain sufficient and necessary conditions for Q-weak efficient solutions of general optimization problems via scalarization.

Keywords : weak efficient, algebraic interior, vector closure, linear space
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