Global Search in Fractional Programming via D.C. Constraints Problem

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This paper addresses a rather general fractional optimization problem, i.e. the problem of optimizing the sum of several rational functions.

We reduce it to a problem with d.c. constraints [1] and develop the global search method based on the global optimality conditions for a problem with nonconvex (d.c.) constraints [2].

The global search method comprises two principal stages:
1) a local search [1], which provides an approximately critical point;
2) procedures of escaping from critical points (provided by a local search method). This procedures consist in constructing an approximation of the level surface of the convex function which generates the basic nonconvexity in the problem, and solving the auxiliary linearized (at the points from the approximation) problems.

The global search algorithm for solving the sum-of-ratios fractional programming problem was verified on a set of low-dimensional test problems taken from literature as well as on randomly generated problems with up to 200 variables and 200 terms in the sum.

References

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