

Programming Problems with a Large Number of Objective Functions

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The paper treats the Multi-Objective Programming problem with a large set of composite objective functions, linear-hundred and nonlinear-thousand, the domain of feasible solutions being defined by a set of linear equations / inequations representing a large scale problem. One constructs a preferred solution i.e. a non-dominated solution chosen via extending the decision-making framework. For the problems defined above, when the objective functions are all linear, there are a lot of classical, very good, solving methods based on SIMPLEX algorithm. But, if beside linear functions, the nonlinear functions appear, the classical methods do not work. Moreover, if the objective functions are in a large number, the solving becomes difficult from a practical point of view. In this particular case, a software platform, composed by a solver for Linear Programming problems and a solver for Multiple Attribute Decision Making problems in combination with Parallel and Distributed Computing techniques based on a GRID configuration, is necessary. The hardware platform has the same importance as the software platform. It is composed by a powerful server and a number of multi-processors distributed in GRID. This number is equal to the linear objective functions' number. If the server remains the same after the pervasive solving service is installed on GRID, the rest of multi-processors may differ from a solving to another solving. On the server are assigned the mathematical modeling operations, i.e. the stocking of mathematical model in a format that facilitates the operations of adding / modifying / deleting its entities, the generating of the MPS problem form, the running of the first phase of the SIMPLEX algorithm and the construction of the preferred solution based on all objective functions' values. On the rest of multi-processors are assigned the optimizations upon the linear objective functions, in the re-optimization regime, which operations are scheduled by server.