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TOWARDS HIERARCHICAL APPROACH FOR LARGE NONLINEAR MULTI-OBJECTIVE PROBLEMS

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Many problems in economics, business and engineering are of the multi-objective type and large scale. One of the approaches to solve multi-objective optimization problems is to convert them into a problem with single objective function. There are several ways of reducing a multicriterial problem into a monocriterial one. Frequently, multi-objective optimization problems are solved by the scalarization method (weighting method). The aim is then to find the Pareto point for the numerical values of target functions. However, as a rule, the best points of target functions are different and a certain compromise point must be found in the parameters space. The idea of weighting method is to associate each objective with a weighting factor and thereafter optimize the weighted sum of objectives.

The generation of either optimal or Pareto optimal points for large and complex systems can be easier if the problem can be decomposed and solved as a set of smaller coordinated subproblems which may be treated indipendently. Problems of high dimension, e.g those arising in electrical, mechanical and aeronautical engineering can sometimes only be solved by the exploitation of their special structure. In order to cope with large scale problems and to develop many optimum plans a multi-level (hiearchical) approach may be useful. The idea of hiearhical decision making is to reduce the overall complex problem into smaller and simpler (of lower dimension) subproblems which can be distributed over a large number of processors or computers. One way to do so is the use of decomposition-coordination schemes, designating processors (computers) as the master and slaves.

In this talk we present some results concerning the study of two most widely used decomposition-coordination approaches based on either the generation of feasible or non-feasble points respectively. In the latter only the values reached at the end of the procedure are assured to be feasible. For finding proper values of coordination parameters some rapidly convergent iterative methods are developed based on the classical cubically convergent method if the feasible approach is used [1]. For the non-feasible approach a few gradient-type methods are examined. Convergence properties and computational aspects of the methods under discussion are studied. Problems of their global convergence and polyalgorithmic strategy of their implementation are discussed as well.

REFERENCES

[1] O. Vaarmann. High order iterative methods for decomposition–coordination problems . *Technological and Economical Development of Economy* , **12** (1), 2006, 56-61.