Abstract

A conventional optimization model generally represents some practical problem in which all the parameters associated with the objective function and constraints are real or deterministic. In real life, formulation of the model is always confronted with various types of uncertainties in the domain of the optimization problem. Modeling these uncertainties as closed intervals is the simplest and best representation of imprecision, where no assumption is necessary to shape the uncertainty between the lower and upper bound of the closed intervals. We call the optimization problems, whose uncertain parameters are closed intervals, as optimization problems with bounded parameters or, in short interval optimization problems. This thesis discusses solution methodologies to handle such type of situations in different optimization models. A partial order relation, named as χ-partial order relation, is introduced for the comparison between two intervals as well as between two interval vectors, and the properties of this partial order relation are studied. Existence of solution of single objective, multi objective and bi-level programming problem with bounded parameters are studied using the concept of χ-partial order relation in different chapters of the thesis. The complete methodology in each chapter is numerically illustrated. Optimization models in finance, transportation problem and waste water treatment system are formulated, for which the proposed methodologies can be applied.

Keywords: Optimization under uncertainty, Interval analysis, Nonlinear programming problem, Multi-objective programming problem, Fractional programming problem, Geometric programming problem, Bi-level programming problem.