

Abstract

Uncertain programming forms an integral part of most of the real life decision making problems. In practice, the optimization of any complex system is often achieved using the deterministic model parameters. Thus in many situations, the decision makers would solve optimization problems which depend on parameters which are mostly unknown. Such problems appear in many areas of applications and are quite difficult to be formulated and solved, both conceptually and numerically.

The uncertainty of model parameters arise because of many reasons like relevant data being inexistent or scarce, difficult to be obtained or estimated, the system being subjected to changes etc. In general, these uncertainties in the input model parameters can be modeled as random variables with “known” probability distribution functions.

Normally, the occurrence of randomness in the problem parameters can be formulated using the stochastic programming (SP) approach within a general optimization framework. These uncertainties may also be characterized by fuzzy, random interval and multi-choice parameters instead of the random variables. The main idea of the present work is to concentrate on the solution procedures for some of the SP problems mainly using two-stage stochastic programming (TSP) and chance constrained programming (CCP) approaches involving some of the input model coefficients, such as cost coefficients, technical coefficients, resource limit values which may be assumed to be continuous random variables, random interval parameters, fuzzy parameters and multi-choice parameters; to solve some of uncertain programming problems. These developed and proposed models have been found to provide a more generalized solution for the uncertain programming problems considered.

Additionally, in the present thesis the SP model has been applied to optimize the real-life air pollution control management planning task of Orissa Mining Corporation Limited. All the developed solution procedures of SP models have been verified using suitable numerical examples.

Keywords: Uncertain Programming, Stochastic Programming, Chance Constrained Programming, Two-stage Stochastic Programming, Quadratic Programming, Fuzzy Programming, Multi-objective Programming, Air Pollution Control Management Planning.