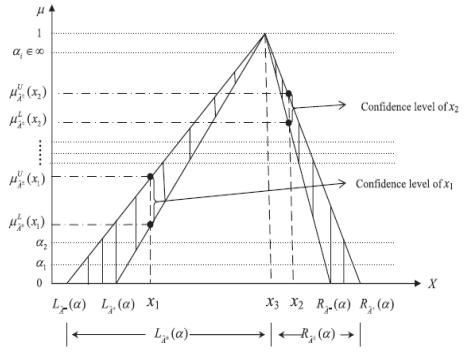
Environmental Systems Analysis and Groundwater Modeling

Mr. Shuo Wang's research interests are environmental systems analysis (solid waste management, water resources management, flood control, and air quality management) and groundwater modeling. He has made efforts to develop a number of optimization techniques for dealing with the issues of uncertainties and their potential interactions that inherently exist in environmental problems. His research achievements can help facilitate informed decision making in an uncertain and complex environment.

An interval-valued fuzzy-stochastic programming approach and its application to municipal solid waste management

An interval-valued fuzzy-stochastic programming (IVFSP) approach is developed for municipal solid waste management. IVFSP is capable not only of tackling uncertainties expressed as intervals, probability distributions and type-2 fuzzy sets, but also of helping waste managers to identify desired waste-flow-allocation schemes and capacity-expansion plans, as well as of facilitating an in-depth analysis of tradeoff between economic efficiency and constraint-violation risk.



Infinite α-cut levels for an interval-valued fuzzy set ($\tilde{A}^{\pm}$).

Interactive two-stage stochastic fuzzy programming for water resources management

An interactive two-stage stochastic fuzzy programming (ITSFP) approach is developed for water resources management. ITSFP can help decision makers to conduct an in-depth analysis of tradeoff between economic efficiency and constraint-violation risk, as well as enable them to identify, in an interactive way, a desired compromise between satisfaction of the goal and feasibility of the constraints (i.e. risk of constraint violation).

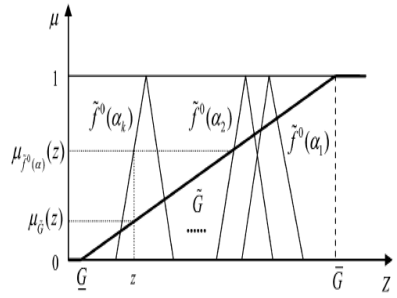
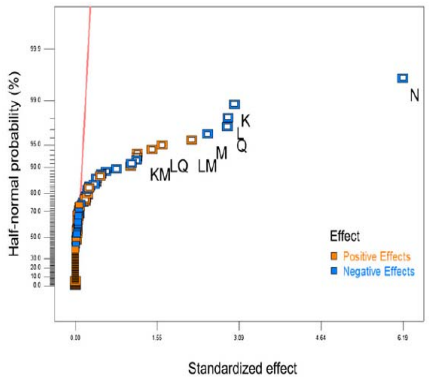


Fig. 1. Possibilistic distributions of the objective-function values and the fuzzy goal provided by the decision makers.

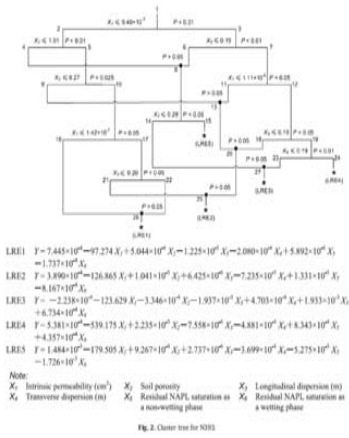
A sequential factorial analysis approach to characterize the effects of uncertainties for supporting air quality management

A sequential factorial analysis (SFA) approach is proposed for supporting regional air quality management under uncertainty. SFA is capable of analyzing the effects of uncertainties and their potential interactions in a systematic manner, which can help decision makers to identify the important factors affecting system performance and explore the valuable information that may be veiled beneath their interrelationships.



Development of a clusterwise-linear-regression-based forecasting system for characterizing DNAPL dissolution behaviors in porous media

Groundwater contamination by dense non-aqueous phase liquids (DNAPLs) has become an issue of great concern in many industrialized countries. In this study, a clusterwise-linear-regression-based forecasting system is developed for establishing a statistical relationship between DNAPL dissolution behaviors and system conditions under discrete and nonlinear complexities. The results reveal that the forecasting system has a superior performance for predicting DNAPL dissolution behaviors in the subsurface.



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