SOME REAL LIFE DECISION MAKING PROBLEMS IN DIFFERENT IMPRECISE ENVIRONMENT

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

in

Science

by

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Registration No: NITD/PhD/MA/2018/01082

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April, 2022

Abstract

In Model-1, we have presented three reduction methods for a type-2 triangular fuzzy variable (T2TrFV) by adopting the critical value (CV). Three generalized expected values (optimistic, CV and pessimistic) are derived for T2TrFVs with some special cases. Then a multi-objective profit transportation problem (MOPTP) with fixed charge (FC) cost has been formulated and solved in type-2 fuzzy environment. Unit transportation costs, FC, selling prices, unit transport times, loading and unloading times, total supply capacities and demands are all considered as triangular Type-2 fuzzy numbers. The MOPTP has been converted into a single objective by using the goal programming technique and the weighted sum method. The deterministic model is then solved using the Generalized Reduced Gradient (GRG) method Lingo 14.0. Numerical experiments with some sensitivity analysis are illustrated the application and effectiveness of the proposed approaches.

In Model-2, we develop a multi-objective four-dimensional transportation model with CaE effects under a hybrid random type-2 fuzzy (HRT2F) environment. Here, per unit fuel cost in Rs/liter, per unit fuel consumption in liter/km, per unit CaE in gm/liter, conveyance capacities, demands and availabilities are taken as HRT2F parameters. In our proposed model, all constraints and all objective functions are de-randomized by the probability chance constraint technique and expected value method respectively. Then, using CV-based reduction method the proposed optimization models is de-fuzzified and finally, using GRG method via Lingo-18.0 software, these modified crisp models are solved. Some real-life information is illustrated by providing numerical examples of the proposed approach – which shows how a decision maker controls minimum costs and CaE. Lastly, we present a comparison between the results obtained by KaM algorithm, NiT algorithm, and the proposed method.

In Model-3, a new type of four dimensional multi-objective multi-item transportation problem (4DMOMITP) is established using uncertain theory. We formulate and derive the expected value goal programming model and chance-constrained goal programming model based on the uncertain theory, where unit transportation cost (UTC), availabilities, capacities of conveyances, demands, unit transportation time (UTT), unit loading and unloading time are represented as uncertain matrices. Based on some properties of uncertain theory, the expected value goal programming model and chance-constrained goal programming model transformed into the corre-

sponding deterministic equivalents form via the soft computing technique i.e. generalized reduced gradient technique named by LINGO-14.0. After that, a real life numerical example is given to illustrate the performance of the models. Finally, the sensitivity analysis of the proposed model is presented through chance-constrained goal programming method with respect to different confidence levels.

In Model-4, using uncertainty theory we introduced and developed entropy-based uncertain four-dimensional transportation problem with fixed charges, discounted costs, and vehicle costs. In this transportation system, we considered a discount policy on the transportation cost which depends on the basis of the transported amount. Here, the discounted costs are in the form of all unit discounts (AlUD), incremental quantity discounts (InQD), and the combination of these two. The main objective is to minimize the total transportation cost via maximum entropy which ensures the number of items to be transported from some source to some destinations by some conveyances through some routes. For optimizing the proposed model, using uncertain programming techniques, we have developed two different models such as expected value programming model and expected constrained programming model. Then, Using minimizing distance method and linear weighted method we formulated and solved the equivalent deterministic transformation of these two constructed models. Finally, to show the application of the proposed models and methods we presented a numerical example with optimal results.

In Model-5, we developed and investigated some four-dimensional profit maximization transportation problems considering damageablity and substitutability, where the parameters are of a type-2 normal uncertain variable in nature. Here, unit transportation cost, distances of the paths, fixed charges, rate of breakability, availability, demands, capacities of conveyances, the unit selling price, unit purchasing cost, unit procurement cost are regarded as type-2 normal uncertain variables. Two models are formulated based on two separate criteria of the substitution items. We use a critical value-based reduction method to reduce type-2 normal uncertain variables into type-1 normal uncertain variables and then apply some properties of uncertainty theory to convert the profit transportation parameters into deterministic form. The two deterministic models are solved using the optimization software named LINGO -18.0. A real-life numerical example and optimal results are presented here to show the application of the proposed model and the proposed reduction method.

In Model-6, we made an investigation about an uncertain interval supply chain network model with risk and visibility (UISCNMwRV). We consider the available budget for supply chain visibility, production capacity, cost of reducing supply risk, cost of enhancing supply chain visibility, demand for each product in each period, the expected value of demand, minimum order quantity, purchase price, the impact of supply risk, supply risk, maximum allowable supply risk, supply chain visibility, minimum visibility are uncertain interval parameters for the effect of resenting pandemic COVID 19. To model the proposed UISCNMwRV, we have developed two different models namely the expected value model (EV model) and the chance constrained model (CC model) using uncertain interval programming techniques. These two models are formulated under the framework of uncertain interval theory. Then, the equivalent deterministic transformations of these models are formulated and are solved two different methods namely goal programming method and linear weighted method. Finally, a real-life example of the UISCNMwRV is included to show the effectiveness and usefulness of our proposed study.

In Model-7, a new design of interval type-2 fuzzy logic systems (IT2FLS) for a profit maximization solid transportation problem is presented. It has been proposed that the antecedent membership function parameters of the IT2FLS are produced randomly with the consequent part parameters being determined practically by the mustard oil producing factory in India. The application of mustered oil factory data sets has been used in order to exhibit the effectiveness of the proposed design of IT2FLS.The unit Transportation cost is determined by using IT2FLS, three inputs- supplies, demands and road conditions and one output parameter. Then a profit maximization solid transportation problem is then formulated with volume and capacity constraints of oil packets and GRG Technique (LINGO-12.0) is used to solve the proposed model. Lastly the optimal results are presented in tabular form and graphically.

In Model-8, we have developed an interval type- 2 fuzzy logic controller (T2FLC) approach for assessment of the risks that workers expose to at construction sites. Using this novel approach, past accident data, subjective judgments of experts, and the current safety level of a construction site are to be combined. The method is then implemented on a tunnelling construction site and risk level for all type of accidents is formulated. In T2FLC assists to trace inputs and outputs in a well-organized manner for building the inferences train so that various types of risk assessment can be

predicted in industry. Finally, a comparative study has been successfully performed with type-1 and type-2 fuzzy dataset for improving risk assessment that can be easily determined in the type-2 fuzzy prediction model for improving accuracy. Validity of the proposed model is done with the help of statistical analysis and multiple linear regressions.