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Fuzzy risk analysis in poultry farming based on a novel similarity measure of fuzzy numbers

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Abstract

Similarity measure between fuzzy numbers is a very important tool in fuzzy risk analysis problems where the parameters involved are linguistic terms. Such types of measure already exist in the literature. The emergence of different types of fuzzy numbers has led to generalization and modification of existing similarity measures. Moreover, newer measures are being proposed owing to the limitations and drawbacks in existing methods. It is seen that most existing similarity measures have numerous drawbacks and limitations. Namely, most of the method is based on geometric distance, hence the concept of the height is missing, which depicts a limitation on the existing method. Further, crisp-valued fuzzy numbers are not at all considered in some of the existing methods. Hence, in this paper, a new method to measure the degree of similarity between fuzzy numbers has been proposed. This measure has been discussed on generalized fuzzy numbers with different left heights and right heights. This measure is not just confined to generalized fuzzy numbers with different left heights and right heights, but also can deal with arbitrary fuzzy numbers. The proposed similarity measure is based on geometric distance, height and radius of gyration point of fuzzy number. In fact, a much generalized method has been proposed which removes all the drawbacks and limitations of the existing similarity measures. The out-performance of the proposed method is illustrated by comparing with existing methods of similarity measure. Further, the proposed method is effectively applied in risk analysis of poultry farming.

Keywords. Similarity measure, radius of gyration, risk analysis, poultry farming.

1 Introduction

Fuzzy risk analysis is gaining popularity among the researchers as in many situation parameters involved are imprecise due to its nature. Schmucker [1] first introduced the fuzzy risk analysis in production system using the parameters probability of failure and severity of loss. Different researchers have proposed different methods at different times for the risk analysis problem. Most of the time, due to its nature the parameters involved in those risk analysis problems are expressed as linguistic terms. Kangari and Riggs [2] proposed a method of risk analysis using linguistic terms. Some of the studies involving risk analysis are Chen [3], Chen and Chen [4, 5, 6], Tang and Chi [7], Wang and Elhag [8], etc. Generally, it happens that the linguistic terms are expressed in terms of fuzzy numbers. Most of the time, the similarity measure between fuzzy numbers is used in the risk analysis problem and other decision making problem. The similarity measure is defined on the different

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