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FUZZY TIME SERIES FORECASTING MODEL BASED ON TRAPEZOIDAL FUZZY NUMBERS AND SIMILARITY MEASURE APPROACH

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ABSTRACT

Forecasting is important to minimize the uncertainty in decision making. Various forecasting methods have been proposed and one of them is the forecasting model using fuzzy time series (FTS). FTS forecasting model can cater for data in linguistic values. However, most of the FTS forecasting models use discrete fuzzy sets as a basis for calculating the forecasted values and, thus, cannot provide the forecasted range under different degrees of confidence. Besides, in order to calculate the forecasting accuracy such as mean square error (MSE) and mean absolute percentage error (MAPE), the forecasted values need to be defuzzified. During the defuzzification process, some information could be lost from the data due to the simplification process. Hence, this contributes to its inability to grasp the sense of uncertainty that has been kept throughout the forecasting procedure. In this study, we propose an FTS forecasting model based on trapezoidal fuzzy numbers with a similarity measure approach. Three methods of partitioning the intervals are used which are average based length, frequency density based and re-divide randomly chosen length. Furthermore, the order of relation of FTS is also considered which are the first order and the second order relation. The forecasting accuracy is evaluated using degree of similarity between fuzzy actual value and fuzzy forecasted value. A combination of three fuzzy similarity measures namely the centre of gravity, area and height is used to evaluate the forecasting accuracy. For implementation purposes, this proposed model is applied to forecast the unemployment rate in Malaysia from the year 1982 to 2013. The result shows that the interval length and the order of FTS will affect the forecasting accuracy. Moreover, the similarity measure concept can be used as an alternative approach to measure the accuracy without going through the defuzzification process.

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