STATE UNIVERSITY OF BANGLADESH
join the trendsetter

A Comparative Study of AHP and Fuzzy AHP Method for Inconsistent Data

CSE-0410 Summer 2021

1. MD.Sherajuddawla Sumon Biswas (UG02-46-17-003), 2. Subarna Khorshed (UG02-48-18-010), 3. Mayesha Tabassum Labiba (UG02-45-17-017)

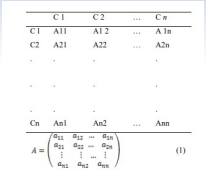
Department of Computer Science and Engineering
State University Of Bangladesh (SUB)

August 9 , 2021

OUTLINES

- Main Summary of the Assigned Paper Include Result
- Proposed Methodology Explanation
- Advantage
- Disadvantage
- Every Terminology of the paper Used
- Experimental Result section Explanation
- Future Work of the Paper

Main summary of the assigned paper



	C 1	C 2	…	C n
C1	A11	A1 2	…	A 1n
C2	A21	A22	…	A2n
.	.	.		.
.	.	.		.
.	.	.		.
Cn	An1	An2	…	Ann

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \quad (1)$$

- AHP and Fuzzy AHP methods are useful tools in decision making when there are multiple criteria and multiple solution alternatives in a situation. If we have n criteria as in Table 1 and preference selection is substituted in the matrix, firstly, the pairwise comparison matrix is created. Table 1 matrix is written as equation in equation. By dividing each element of the matrix by the column sum, the normalized matrix is created, then the new N matrix is created and we get the values of the W row matrix, from which the row averages of the N matrix are obtained, the highest values Ž00bŽ00bfrom which the final result is obtained. This is all about the AHP method that Taha is discussing. Both AHP and Fuzzy AHP deal with stochastic data. Fuzzy logic allows for the quantification of uncertainty and the generation of the decision outcome.

Main summary of the assigned paper Cont...

	ENG	PIS	RMG	STF	SRT
ENG	0.053	0.263	0.111	0.278	0.350
PIS	0.263	0.053	0.333	0.167	0.150
RMG	0.211	0.211	0.056	0.056	0.050
STF	0.316	0.421	0.056	0.056	0.400
SRT	0.158	0.053	0.444	0.444	0.050

- Figure 9 respectively. Since these data sets are used in purchasing system analysis and the parameters do not change, various parameters are used in Data Analysis. Descriptions of these parameters are not required in this research article. We can see the ups and downs of the curves in the figures and we have summarized the changes and similarities-differences in Table 36. We tried to draw the conclusion of this research study in Table 37 and Table 38.
- **Result**

  AHP curve properties. As the fuzzy data is increased, we see that the AHP data for the fuzzy reduction increases and decreases successively, and in most cases, except for a few samples, the jitter of both curves is the same for many samples.

Proposed Methodology Explanation

- After the most important maintenance factors were identified, the fuzzy AHP (analytical hierarchy process) method and fuzzy TOPSIS (technique for order preference by similarity to ideal solution) were used to determine the right judgment of maintenance factors affecting sustainable manufacturing based on the company specific requirements. In this respect, F-AHP can be very useful in involving several decisionmakers with multiple conflicting criteria to reach a consensus in the decision-making process.
- In order to choose the most appropriate maintenance factors, the MICMAC analysis in this research was proposed. MICMAC allows one to determine interactions between factors and by grouping factors into clusters it helps to reduce the size of some complex problems, making them more manageable and revealing hidden relationships between various considered factors.

Proposed Methodology Explanation Cont...

- After the most important maintenance factors were identified, the fuzzy AHP (analytical hierarchy process) method and fuzzy TOPSIS (technique for order preference by similarity to ideal solution) were used to determine the right judgment of maintenance factors affecting sustainable manufacturing based on the company specific requirements. In this respect, F-AHP can be very useful in involving several decisionmakers with multiple conflicting criteria to reach a consensus in the decision-making process.
- On the other side, the F-TOPSIS technique is used to calculate alternatives ratings. The choice of the TOPSIS is due to its capability of ranking a wide number of alternatives. This approach can be considered as a driver in implementing the alternative that represents the best trade-off according to the various considered criteria. Considering the above, the aim of this paper is to analyze the maintenance factors influencing the implementation of sustainable manufacturing challenges from a tactical perspective, to determine the relationships between them, and to rank them taking into account the specificity of an operational context of an enterprise.

Advantage and Disadvantage

Advantages:

- The authors provided a good introduction at the very beginning of the paper that gives an idea of the basic concepts.
- There is a solid data analysis that proves the point authors tried to make.
- Heavy usage of keywords like - AHP, Fuzzy AHP, MCDM makes the paper more appealing.
- Good explanations of used methods (AHP, Fuzzy AHP) are helpful for easy understanding.
- At the end of the paper, a very good conclusion and summary of results are given which reflects on the whole study.
- A good number of references.
- Well organized.

Advantage and Disadvantage

Disadvantages:

- The uses of some words were seemed grammatically incorrect to us.
- Unfortunately, the authors didn't address the future works of the study.

Every terminology of the paper used

- AHP has particular application in group decision making, and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare and education.
  Rather than prescribing a "correct" decision, the AHP helps decision makers find one that best suits their goal and their understanding of the problem. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

Experimental Result section explanation

The authors used AHP method and Fuzzy AHP method, which is also known as Fuzzy MPDM (Multi-person decision making) or more specifically MPPC (Multi-person preference criteria), to reach a conclusion and a result.

Respected authors observed the results of AHP and Fuzzy MCDM comparison on a table. Table content stated as follows-

- 1. Increase or decrease in AHP makes an increase or decrease in Fuzzy respectively 50%
- 2. Increase or decrease in AHP makes reverse swing in Fuzzy 32.36%
- 3. Either AHP or Fuzzy remain unchanged for any slope of Fuzzy or AHP Respectively 17.64%

Their analysis of the results tells us Fuzzy Curve and AHP curve have similarities in nature. For most of the cases of this study, an increase or decrease in Fuzzy data creates a successive increase and decrease in AHP data. It can also be seen that the vibration of both curves is the same for most of the samples.

Future work of the paper

- Unfortunately, the authors didn't mention the future works of this study in the paper.


Thank
You