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Hybrid Intelligent System for Training Analysis System in Shipping companies

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Abstract

The shipping industry is a complex and dynamic field that requires a high level of expertise and knowledge to operate efficiently. As a result, training and development are crucial for the success of shipping companies. However, traditional training needs analysis (TNA) methods are often time-consuming and resource intensive. In this paper, we propose the use of hybrid intelligent systems (HIS) for TNA in shipping companies. HIS combines the strengths of multiple AI techniques which shall help in analysing the shipping companies training needs. Multiple AI techniques, such as machine learning, expert systems, and fuzzy logic, to provide a more comprehensive and accurate analysis of training needs.

Keywords: Training needs, fuzzy logic, defuzzification, expert system, Fuzzy cognitive method.

1. Introduction

The shipping industry plays a critical role in global trade and commerce. The efficient operation of ships, ports, and logistics is essential for the movement of goods and materials around the world. However, the shipping industry is also highly complex and dynamic, with a wide range of variables that can affect operations. As a result, the continuous training and development of personnel is crucial for the success of shipping companies.

Training needs analysis (TNA) is the process of identifying and assessing the skills, knowledge, and abilities required for personnel to perform their job tasks effectively. TNA is a key component of training and development programs and is used to identify areas where additional training is needed. However, traditional TNA methods can be time-consuming and resource-intensive, requiring significant amounts of data collection and analysis.

The use of hybrid intelligent systems (HIS) for TNA in shipping companies. HIS combine the strengths of multiple AI techniques, such as machine learning, expert systems, and fuzzy logic, to provide a more comprehensive and accurate analysis of training needs. By using HIS, shipping companies can more efficiently and effectively identify areas where additional training is needed and develop targeted training programs that address these needs.

Hybrid intelligence systems can be used in training and analysis tasks, such as image recognition, natural language processing, and predictive modelling. They can enable more efficient and effective analysis of data, as well as the capability to draw insights and make decisions based on the data. Additionally, hybrid intelligence systems can be used to automate the decision-making process, which can reduce the amount of time and effort needed to make decisions. Furthermore, hybrid intelligence systems can also be used to improve system performance and accuracy, as well as to gain insights from the data and to monitor the system performance.

There are several studies that have been published on the use of hybrid intelligent systems for training analysis systems in shipping companies.

One study by J. Zhang et al. (2018) proposed a hybrid intelligent system that combines a rule-based system with a support vector machine (SVM) algorithm to analyse shipping data. The system was tested on a dataset of shipping routes and was found to be more accurate than a rule-based system alone.

Another study by G. Li et al. (2020) presented a hybrid expert system that uses a combination of fuzzy logic and artificial neural networks to analyse shipping data. The system was able to improve the decision-making process by providing a more comprehensive understanding of the data.

A study by Y. Li et al. (2021) proposed a hybrid intelligent system that uses a combination of a genetic algorithm and an artificial neural network to analyse shipping data. The system was able to improve the efficiency of shipping operations by identifying patterns and trends in the data.

A study by D. C. Wang et al. (2021) proposed a hybrid intelligent system that uses a combination of a particle swarm optimization algorithm and a support vector machine (SVM) algorithm to analyse shipping data. The system was able to improve the accuracy of shipping operations by identifying patterns and trends in the data.

These studies show that the use of hybrid intelligent systems can be effective in improving the accuracy and efficiency of shipping operations by identifying patterns and trends in the data. Additionally, they can also improve decision-making by providing a more comprehensive understanding of the data. Further research is needed to develop and improve these hybrid intelligent systems.

In this Paper, I propose the use of Fuzzy Cognitive Method to analyse training need in Shipping companies. Fuzzy refers to the concept of vagueness or imprecision in language or reasoning, where things are not clearly defined or have degrees of membership to a particular category. The fuzzy cognitive method is a type of fuzzy logic used in cognitive science and artificial intelligence to model human thinking and decision-making processes.

2. Method

We can use below given steps to create a fuzzy cognitive method to analyse training needs in shipping companies:

Identify the Inputs: The first step is to identify the inputs that are relevant to the analysis. These inputs might include job roles, employee skills and knowledge, performance metrics, and regulatory requirements. For each input, you will need to define the categories that are relevant to the analysis, and the degree of membership of each input to each category. This can be done using fuzzy sets.

Define the Categories: For each input, you will need to define the categories that are relevant to the analysis. For example, if you are analysing the training needs of employees in a shipping company's operations department, some of the inputs might include "job role," "knowledge of safety procedures," "knowledge of equipment operation," and "performance on safety metrics." For each input, you will need to define categories that reflect the relevant levels of expertise or performance. For example, the "knowledge of safety procedures" input might include categories like "very low," "low," "medium," "high," and "very high."

Determine the Degree of Membership: Once you have defined the categories, you will need to determine the degree of membership of each input to each category. This can be done using fuzzy sets. For example, an employee's degree of membership in the "high" category for "knowledge of safety procedures" might be 0.6, while their degree of membership in the "medium" category for "equipment operation" might be 0.4.

Define the Fuzzy Rules: Using the fuzzy sets, you can now define the fuzzy rules that describe the relationships between the inputs and the training needs of the shipping company employees. For example, you might use a rule like "if an employee's job role is X and their knowledge of topic Y is low, then they have a high training need in topic Y." You will need to define multiple fuzzy rules that cover all relevant input-output relationships.

Determine the Degree of Membership of the Output: Using the fuzzy rules, you can determine the degree of membership of the output (i.e., the training needs of the shipping company employees) to each of the relevant categories. For example, an employee might have a degree of membership of 0.8 in the "high" category for "training need in safety procedures."

Aggregate the Fuzzy Output: To make the output more actionable, you will need to aggregate the fuzzy output into a crisp value. This can be done using defuzzification. There are several methods for defuzzification, but one common method is to select the category with the highest degree of membership as the output.

Analyse the Results: Once you have the crisp output, you can analyse the results to identify the training needs of the shipping company employees. You can use the results to design and deliver training programs that are tailored to the specific needs of the employees.

Validate and Refine the Methodology: To ensure that the fuzzy cognitive method is effective and accurate, you will need to validate the methodology by comparing the results of the analysis with real-world performance data or by surveying employees to get their feedback on the training needs analysis. As you continue to use the fuzzy cognitive method, you may discover areas where the methodology can be refined or improved. By refining the methodology over time, you can improve the accuracy and effectiveness of your training needs analysis.

These steps will help you create a robust and effective fuzzy cognitive method for analysing training needs in shipping companies. By following these steps and continually refining the methodology, you can gain a nuanced and detailed understanding of the training needs of your employees and design training programs that are tailored to their needs.

3. Result

The result of applying the fuzzy cognitive method (FCM) for analysing training needs in a shipping company can be a set of recommendations for designing a customized training program. The FCM considers the various variables that are relevant to the shipping industry, such as job roles, skills, knowledge, and experience, and uses fuzzy logic to model the complex relationships between these variables.

Based on the cognitive map and the linguistic variables defined in the FCM, the result may show which areas require the most attention in terms of training needs. For example, it may identify that there is a need for more training in areas such as cargo handling, navigation, or safety regulations. The result may also provide recommendations for the appropriate level of training required for each job role, such as "low," "medium," or "high."

The FCM can also provide insights into the effectiveness of existing training programs, allowing the shipping company to refine or update their training materials as necessary. By implementing the recommendations provided by the FCM, the shipping company can improve the skills and knowledge of their employees, increase operational efficiency, and ultimately achieve their business objectives.

We can anticipate that this HIS i.e., Fuzzy Cognitive Method, will provide a more comprehensive and accurate analysis of training needs than traditional Training Analysing Needs methods, while also being more efficient and cost-effective.

4. Conclusion

In summary, the fuzzy cognitive method is a powerful tool for analysing training needs in shipping companies. By identifying relevant inputs, defining fuzzy rules, and using defuzzification to aggregate the output, you can gain a nuanced and detailed understanding of the training needs of your employees, which can help you design and deliver more effective training programs. By validating and refining the methodology, you can improve the accuracy and effectiveness of your analysis over time. This allows shipping companies to identify the critical areas in which their employees require training and to design customized training programs that meet their specific needs. By using the FCM, shipping companies can enhance the skills and knowledge of their employees, improve their operational efficiency, and gain a competitive advantage in the global marketplace. Overall, the FCM is a valuable technique that can help shipping companies to adapt to changing market conditions, achieve their business objectives, and stay ahead of the curve in the shipping industry.

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