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Synergistic Modelling for Project Risk Analysis using Fuzzy Monte Carlo Simulation

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Abstract:

The risk analysis process is now significantly subject to substantial uncertainties and subjectivity due to the increasing complexity and dynamic nature of projects. Some investigation challenges include a blend of quantitative and subjective information, making customary quantitative risk evaluation techniques inadequate for focusing on risk evaluation. Fuzzy sets are a powerful tool for modelling uncertainty and vagueness in real-world problems. They can be used to solve problems where precise boundaries are unclear. Even though it demonstrates vulnerability and unclearness, it requires input as crisp data. This paper demonstrates Monte Carlo input with the Type-1 fuzzy sets to evaluate the risks and associated strategies to manage those risks of wind turbine or farm installation projects. This procedure consolidates the knowledge and skill of specialists who add to take a chance with recognizable proof and organizing, as well as membership functions used to assess risk influence, risk likelihood, and hazard importance. This procedure incorporates understandings and expertise from experts who contribute to risk identification and structuring, as well as subjective assessments of parameters used to evaluate overall risk: risk impact, risk probability, and risk significance, which involves risk priority setting, resource allocation, risk response planning, and communication. The factors are expressed using qualitative scales defined by triangular and/or trapezoidal fuzzy membership functions to capture the imprecision in linguistic variables and to address the vagueness and uncertainty in risk factors. Compared to other fuzzy risk assessment methods, the novelty of this assessment procedure includes using Monte Carlo inputs instead of crisp values in determining the membership value. The offshore wind turbine project risk assessment was demonstrated using the fuzzy Monte Carlo technique.

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