**OPTIMAL PRODUCT VERIFICATION AND VALIDATION PLANNING AND DESIGN FOR RELIABILITY USING TEXT MINING**

**ABSTRACT**:

Failure mode and effects analysis (FMEA) has been widely used in product design process as a reliability analysis technique. Design FMEA (DFMEA), which is used in the product development phase to identify and mitigate product risk, is one of the three application scenarios of FMEA. During the DFMEA process, verification and validation (V&V) activities are proposed to mitigate the risk of the identified potential failure modes. The V&V activities can be further planned and implemented to improve the product reliability under development. However, the DFMEA report usually contains rich text descriptions of potential failure modes and causes, and it is difficult and no intuitive to fully understand these information for design improvements. In addition, it is also very challenging to optimize the planning of V&V activities by selecting a set of V&V activities to achieve expected reliability improvement effectiveness with the minimum resource consumption requirement. To address these two challenges, this article first proposes a method of applying text mining to the DFMEA report to obtain two types of hidden reliability information, including the classifications of failure modes/causes and the correlation between keywords. Then, a mathematical model is proposed to optimize the product V&V planning by selecting an optimal set of V&V activities. The application of the above proposed methods is illustrated through the product development of a diesel engine power generation system.

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| **EXSISTING SYSTEM** | **PROPOSED SYSTEM** |
| * Presented a novel risk priority model for FMEA by using interval two-tuple linguistic variables and an integrated multicriteria decision making method to determine risk ranking of the identified failure modes comprehensively. * In summary, the existing research on DFMEA has been focusing on how to reduce the inherent vagueness in the human judgment and better determine the priority ranking of failure modes. * However, there is little research on the following two challenges: 1) How to deal with large amounts of text information in the DFMEA report? 2) How to optimize the product V&V activities planning in an effective and quantitative. | * This article first proposes a method of applying text mining to the DFMEA report to obtain two types of hidden reliability information, including the classifications of failure modes/causes and the correlation between keywords. * Then, a mathematical model is proposed to optimize the product V&V planning by selecting an optimal set of V&V activities. * The application of the above proposed methods is illustrated through the product development of a diesel engine power generation system. |
| **EXISTING ALGORITHM**  Traditional DFMEA report | **PROPOSED ALGORITHM:-**  Verification and Validation Planning |
| **ALGORITHM DEFINITION:-**  The discovered hidden reliability improvement information such as the failure correlation and classification has not been well understood and utilized through traditional DFMEA reports. Such newly discovered reliability information can provide significant guidance for product design improvement at earlier design stage. Second, a quantitative product V&V activities planning model is proposed for the first time by considering the precedence constraints of V&V activities implementation, as well as cost and time constraints for implementing an optimally selected set of V&V activities. | **ALGORITHM DEFINITION:-**  During the DFMEA process, design verification and validation (V&V) activities can be proposed through the V&V method to mitigate the risk of the identified potential failure modes. V&V is a method to verify and validate that a product, service, or system meets design specifications and fulfills its intended functions [4]. V&V activities are engineering tasks for design risk assessment and mitigation such as engineering analysis and calculations, design simulations, and physical tests. Within the scope of product V&V, the verification part plays as a quality control mechanism that is used to assess whether products, systems, and/or services comply with regulations, requirements, specifications, or imposed conditions at the beginning of a development phase. |
| **DRAWBACKS:-**   * A linear programming model is also developed to obtain the optimal weights of risk factors when the weight information is incompletely known a priori. * A novel risk priority model for FMEA by using interval two-tuple linguistic variables * Integrated multicriteria decision making method to determine risk ranking of the identified failure modes comprehensively. | **ADVANTAGES:-**   * programming model * tuple linguistic variables * decision making method |

**MINIMUMSYSTEM REQUIREMENTS**

**HARDWARE REQUIREMENTS**

* PROCESSOR : DUAL CORE 2 DUO.
* RAM : 2GB DD RAM
* HARD DISK : 250 GB

**SOFTWARE REQUIREMENTS**

* FRONT END : J2EE (JSP, SERVLET)
* BACK END : MY SQL 5.5
* OPERATING SYSTEM : WINDOWS 7
* IDE : ECLIPSE

**System Architecture.**

