

A research on the Introduction of AI Function in Operating Experience System

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1. Introduction

Systematic collection, analysis, and utilization of operating experience data are essential to ensure the safety of nuclear power plants and prevent recurrence of similar events. The existing method of writing operating experience reports has limitations such as manual summarization, manual classification, and low search efficiency, which reduces the usability of information. Additionally, a significant amount of time is spent exploring similar events when creating Just-In-Time(JIT) documents, which is the process of sharing and discussing similar events and lessons learned before a major task or test. In this study, we designed an AI-based operating experience system to examine automatic summarization and writing upon report upload, automatic classification of key sections, and automatic recommendation of keyword-based similar events and lessons learned during JIT production. This system is expected to increase the usability of information for nuclear power plant operators and technical support departments and contribute to improving the safety culture of nuclear power plants.

2. Methods and Results

In this section, we reviewed the introduction of AI in the operating experience system, including automatic summarization and creation of operating experience reports, and automatic recommendation of keyword-based JIT similar events and lessons learned. For each function reviewed, we would like to check the improvements and necessary AI functions.

2.1 Automatic summary and creation of operating experience reports

< Fig1. Current screen for writing a operating experience report>

Currently, KHNP's operating experience report writing method is one in which the user directly inputs everything from the report summary to the content, results, cause analysis, and corrective action. This is an iterative process of creating a hard copy report at the nuclear power plant where the event occurred and then re-entering the contents before creating a report using the operating experience system. As a result, it takes a long time to register a report in the system, and productivity decreases, such as repetitive writing of the report content. In addition, the quality of the report is likely to vary according to the user's capabilities.

첨부파일

- 첨부파일 추가 시 주요 내용을 추출하여 자동으로 입력됩니다.
- 내용을 알맞게 입력되었는지 확인하시고 수정이 필요한 부분은 직접 수정하시기 바랍니다.



문건경험

< Fig2. Improvement of Operating Experience Report Screen>

To improve this problem, the attachment upload, which was performed in the final step of the conventional report preparation procedure, is placed in the first procedure. When a user uploads a file, it summarizes the

uploaded documents using AI functions, classifies the main sections of the report, and introduces a function that is automatically entered into an appropriate field. Transformer-based pre-learning language model for automatic summarization of reports, and multi-label text classification function review for report main item classification.

2.2 Keyword-based JIT similar events and lessons automatically recommended

Just-In-Time is an activity within 10 to 20 minutes to review and discuss similar events, past mistakes, lessons learned, and safety procedures just before important or high-risk tasks, tests or events. This is to remind the operator's attention and remember the previous failure case to prevent the recurrence of similar events. This action is used internationally not only in the aviation, chemical, and oil refining industries, but also in the nuclear industry, and KHNP has time to discuss technical information using KHNP-JIT at pre-job briefings.

④ 관련 기술정보(산업계 경험 및 KHNP-KHNP-JIT 작업전회의 자료) 토론	

< Fig3. JIT utilization items in the pre-job briefing >

However, KHNP-JIT has not been updated with the latest significant operating experience, so its utilization has fallen, and each power plant is directly looking for and writing similar events in different forms. This involves the occurrence of quality deviations and excessive labor of each power plant JIT.

- 키워드를 입력하면 AI가 자동으로 운전경험과 교훈을 추천합니다.
- 적합한 운전경험과 교훈을 선택하시면 표준 템플릿에 자동으로 입력됩니다.



Just In Time ** 행위(자동 작성)	
-종료일 참조-	
주요 운전경험	
운전경험 : AI 자동작성	
발생원인 : AI 자동작성	관리번호 : AI 자동작성
내용	AI 자동작성
중요사항	AI 자동작성

** 작업 시 중요 고려사항(교훈)

AI 자동작성

< Fig4. Draft JIT Standard Template >

In order to improve such problems, it is necessary to develop a standard template of JIT, and to develop a function that automatically recommends and inputs similar operating experiences and lessons when a user inputs a keyword. Sentence embedding and vector DB-based similarity search should be reviewed for recommendation of similar operating experience, and Named Entity Recognition(NER) and relationship extraction function should be reviewed for lesson extraction.

3. Conclusions

This paper introduces AI into the nuclear power plant operating experience system, automatically summarizes, prepares, and classifies operating experience reports, and proposes ways to implement JIT similar events and lesson recommendation functions. Through this, effects such as improving the speed of processing operating experience data, increasing information utilization efficiency, strengthening operator decision-making support, and promoting the internalization of safety culture can be expected. In the future, it is necessary to develop and verify a prototype system based on the actual nuclear power plant operating experience dataset and improve algorithm performance and User Experience (UX) based on empirical results.

REFERENCES

- [1] INPO WANO COG's JIT form
- [2] KHNP's internal procedure of pre-Job-Briefing
- [3] KHNP's internal procedure of utilization and management of operating experience