

제조시스템에서 효율적 의미전달을 위한 존재론적 접근 방법

Ontological Approach for Effective Semantic Conveyance in Manufacturing Systems

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Abstract

최근 들어 제조가 발생하는 모든 분야에서 정보의 의미론적 전달방법 및 체계를 정형화하는 작업이 표준화와 더불어 활발히 진행되고 있다. 제조시스템에서 문제가 발생하였을 때 간결하고 정확한 문제 진단에 대한 정보전달은 비용의 절감은 물론 생산성 향상을 위해서도 필수적인 요소이다. 본 연구에서는 제조시스템에서 최적화된 정보전달을 위한 상황이론적 방법론을 제시한다. 본 연구에서 제시하는 방법론의 궁극적인 목적은 실제 제조공정이나 현장에서 발생하는 복잡한 정보의 흐름, 표현, 관리를 효율적으로 할 수 있고 작업자, 관리자, 경영자 모두가 공통적으로 활용할 수 있는 정형화된 틀을 만드는데 있다. 본 연구에서 제시하는 방법론은 제조 현장에서 공정상의 문제점을 분석하고 검사할 수 있는 도구로 활용될 수 있을 것이다.

Keyword : Situation Theory, PRF, Manufacturing Systems, Ontology

1. 서론

Optimal information conveyance in manufacturing systems plays an important role not only for saving cost but also for increasing production. Recently many

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researchers and practitioners [1][2][3] have increased the interest of knowledge-based or information-based management. Many researchers assert that technology and innovation processes are formed by information bases and continuous flows of information. Accurate and concise information is a prerequisite factor to utilize information-based management effectively. In other words, it is necessary to have a toolbox, which can extract available information from unrefined and complex data. As an effort of the above objective, Rosenberg and Devlin [5] made PRF (problem report form) that can easily capture the problems occurred in manufacturing system. However, their effort is limited to computer manufacturing company and there is no connective technique among main components for easier understanding about problems occurred. The main objective of this paper is to provide a revised PRF that contains a connective technique for main components in PRF.

2. Situation Theory

Situation theory(ST) has been devised to develop a unified mathematical theory of meaning and information content and to clarify and resolve various long-standing problems through the use of an interdisciplinary effort from cognitive science, computer science and artificial intelligence, engineering, linguistics, logic, philosophy, and mathematics. The mathematical foundations of the theory are based on intuitions basically coming from set theory and logic. In short, ST is a theory about the "flow and support of information". There are four major concepts of ST such as [4][7]: Infons, Situations, Constraints, Actons

3. Basic Ontology

Ontology provides a vocabulary for representing and communicating knowledge about some topic and a set of relationships that hold among the terms in the vocabulary and so they are very powerful resources to share knowledge [6]. Ontology is an inventory of the kind of things that are presumed to exist in a given domain together with a formal description of the salient properties of those things and the salient relations that hold among them (KBSI, 1996). This paper uses ontological approach for the technique. According to Devlin [4], the basic ontology of situation theory consists of entities that a finite, cognitive agent individuates and/or discriminates as it makes its way in the world.

4. PRF (Problem Report Form)

According to Rosenberg and Devlin [5], the principal function of the PRF is to provide various human experts with information; not any information, but information relevant to that expert's role and responsibilities within the organization. In other words, the purpose of the PRF is to identify and classify additional knowledge, and investigate the way it is used in the interpretive process by symbolic encoding and symbolic configuration that can be recognizable. There are three main components in PRF according to whether the document requires interpretation as a scene, a story, or an explanation. For given a situation, each component can be described by different ways.

- A Scene:

There are some people. A man is carrying bats. Five men are carrying gloves and balls. Some people are walking and speaking.

- A Story:

There are some people. Nine men are carrying gloves and balls. A man wearing a typical uniform speaks something to them. The remaining people all listen to him.

- An Explanation:

A baseball game is taking place. The director, wearing a typical uniform, speaks to the players. Nine people are main players. The other people are candidates for players.

In addition to the above three main components, it is necessary to know the concept of "call text" and "clearance text" for reading and interpreting a PRF. The call text provides us location of the fault and the possible patterns of faulty behavior, whereas the clearance text gives us a part plus condition and an action to be done.

4. Revised PRF

Nowadays data mining, a mathematical analysis technique, has been become a hot topic for researchers in DBMS (database management system). In short, the definition of data mining is to identify patterns or correlation in data. Similarly to data mining, the main idea of the revised PRF is to classify the constituents in PRF according to information needed in systems. For given a situation, specific information is not always needed. Sometimes, general or abstract information could be sufficed. In this view, the revised PRF classifies the constituents in PRF into 3

groups.

Group 1: \dot{N} , \dot{M} , \dot{S} , \dot{C}

Group 2: \dot{V} , \dot{T} , \dot{k} , \dot{U} , \dot{P}

Group 3: \dot{t}_r , \dot{t}_c , $\dot{\theta}_1$, $\dot{\theta}_2$

For the effective use of the PRF, Rosenberg and Devlin [5] suggest that interpretation of the document can require three very different kinds of knowledge.

5. Conclusion

The main objective of the PRF is to provide various human experts with refined information relevant to that expert's role and responsibilities within the related manufacturing systems. However, the original PRF does not have a connective technique for scenes, stories, and explanations. As a revised PRF, this paper proposes a technique, which can provide more specific description of what happen in the manufacturing field. Through this technique, the revised PRF can be applied as an inspector and an analyzing tool of process problem in manufacturing systems according to the necessity of information.

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