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Knowledge Discovery of Hospital Medical Technology Based on Partial Ordered Structure Diagrams

Dingju Zhu, South China Normal University, China*
Jianbin Tan, South China Normal University, China
Guangbo Luo, First Clinical Medical College, Guangzhou University of Chinese Medicine, China
Haoxiang Gu, University of Alberta, Canada
Zhanhao Ye, South China Normal University, China
Renfeng Deng, South China Normal University, China
Keyi He, South China Normal University, China
KaiLeung Yung, Hong Kong Polytechnic University, China
Andrew W. H. Ip, University of Saskatchewan, Canada
https://orcid.org/0000-0001-6609-0713

ABSTRACT

So far, no research has used the partial order algorithm for the mining of hospital medical technology. This paper proposed a novel knowledge discovery method of hospital medical technology based on partial ordered structure diagrams, constructed attribute partial ordered structure diagram and object partial ordered structure diagram for the formal context constructed by hospital set and medical technology set, and finally analyzed them using the knowledge discovery method. The experiments show that the partial ordered structure diagram can effectively visualize the structural relationships between hospital sets and medical technology sets, and the distribution characteristics of medical technology sets in hospital sets and the rules of medical technology sets owned by hospital sets can be obtained based on the node, branch, and group structure relationships of the partial ordered structure diagram.

KEYWORDS

Common Attribute, Data Analysis, Data Visualization, Formal Context, Knowledge Discovery, Medical Technology Set, Partial Ordered Structure Diagram, Unique Attribute

INTRODUCTION

The relationships involved between hospital sets and hospital technology sets include the association between hospitals and hospitals, the inclusion relationship between hospitals and medical technologies, and the association between medical technologies and medical technologies. Different medical

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technology sets are directly related to the medical services that different hospitals can provide, and the size of the medical technology set that a hospital owns is closely related to the comprehensiveness of the hospital's treatment capabilities (Xu, 2013). In addition, there may be concomitant relationships between medical technologies, and certain medical technologies can significantly mark certain hospitals. The partially ordered structure diagram is a good data analysis tool for visualizing the connections and rules embedded in the data (Fan et al., 2013).

In reality, everything possesses multiple characteristics. *Attributes* are generalized expressions of characteristics, which can focus on the features of things. The commonality and individuality of attributes are the connections that commonly exist between things. *Commonality* is the phenomenon that the same attribute is possessed by most things, and it reflects the law that things exist universally. Individuality is the phenomenon that things have certain properties alone, which reflects the special characteristics of individual things that distinguish them from other things. The process of recognizing things is the process of recognizing the commonality of things to recognizing the individuality of things, which represents a top-down hierarchy, and this hierarchy can be represented by the attribute partially ordered structure diagram. The *attribute partially ordered structure diagram* (APOSD) can clearly reflect the hierarchical relationship between attributes, and this hierarchical relationship represents the common attributes and individual attributes of things, which is a good knowledge representation method. The knowledge discovery process based on a partially ordered structure diagram is shown in Figure 1.

The matrix formed with attributes and objects as rows and columns of the matrix is called the *formal context*, and the APOSD is constructed based on the formal context. The visual structure it presents is a closed tree diagram structure, where each node in the diagram represents an attribute. There are two special nodes in the diagram, which are located at the topmost and bottommost levels of the diagram. The top-level node represents the attributes owned by most objects in the object set, and the bottom-level node represents the full set of attributes (corresponding to the empty object set). Nodes closer to the top level indicate that the attribute represented by the node is owned by more objects, which means that the attribute better reflects the commonality of the objects; on the contrary, nodes closer to the bottom level indicate that the attribute represented by the node is owned by fewer objects, which means that the attribute better reflects the individuality of the objects. Each path from the topmost node of the APOSD to the bottommost node represents an object, and each node on the path belongs to the attribute of that object.

CURRENT CHALLENGES FACING THE ORGANIZATION

Hong et al. (2014) from Yanshan University constructed a partially ordered structure diagram with the basic purpose of describing the relationship between attributes and distinguishing objects, guided by the philosophical principles of human cognition of things, and elaborated its construction method. In the same year, S. X. Li et al. (2014) proposed a computer-generated algorithm for partially ordered structure diagrams in order to solve the inherent drawbacks such as the inefficiency of drawing partially ordered structure diagrams manually, which reduced the labor cost of drawing and accelerated the drawing speed, further promoting the application and development of partially ordered structure diagrams. From 2015 to 2017, Yu et al. (2016) and Zhang et al. (2017) continued to deepen the theory and broaden its application areas based on their understanding of partially ordered structure theory. For example, Yu applied the theory of partial order structure diagram to improve the accuracy of *word sense disambiguation* (WSD), established the formal context of English prepositions over fine-grained WSD based on the SemEval corpus, generated the corresponding APOSD and used it as a model for WSD. Zhang introduced a new conceptual lattice visualization method and an APOSD to obtain the analysis method of daily variation characteristics of PM 10 concentration. The effectiveness and rapidity of the proposed method were confirmed by the in-depth analysis of the APOSD with the granularity of PM 10 concentration data, the patterns were grasped, and new relationships were

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