

Accepted Manuscript

Characteristics of three-way concept lattices and three-way rough concept lattices

Huiying Yu, Qingguo Li, Mingjie Cai

PII: S0950-7051(18)30058-3
DOI: [10.1016/j.knosys.2018.02.007](https://doi.org/10.1016/j.knosys.2018.02.007)
Reference: KNOSYS 4215



To appear in: *Knowledge-Based Systems*

Received date: 2 May 2017
Revised date: 15 January 2018
Accepted date: 3 February 2018

Please cite this article as: Huiying Yu, Qingguo Li, Mingjie Cai, Characteristics of three-way concept lattices and three-way rough concept lattices, *Knowledge-Based Systems* (2018), doi: [10.1016/j.knosys.2018.02.007](https://doi.org/10.1016/j.knosys.2018.02.007)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Characteristics of three-way concept lattices and three-way rough concept lattices

Huiying Yu ^{a,b}, Qingguo Li ^{a,*}, Mingjie Cai ^a

^aCollege of Mathematics and Econometrics, Hunan University, Changsha 410082, China

^bSchool of Mathematics and Statistics, Changsha University of Science and Technology, Changsha, Hunan 410114, China

Abstract: In classical formal concept (Wille's concept) analysis, a basic theorem about concept lattices is that every concept lattice is a complete lattice and conversely, every complete lattice is isomorphic to a concept lattice. Three-way concept analysis is an extended theory of formal concept analysis. Similarly, three-way concept lattices and three-way rough lattices are also complete lattices. However, unlike the classical case, not every complete lattice arises as a three-way concept lattice (or as a three-way rough concept lattice). In this paper, we focus on characterising those complete lattices which can be represented by three-way concept lattices. In order to achieve this, we first discuss some properties of special elements such as atoms and irreducible elements, and complements of three-way concept lattices. Then we give our main theorem by displaying conditions under which any complete lattice can be realised as a three-way concept lattice. Similar results are discussed and obtained for three-way rough concept lattices.

Keywords: Complete lattice; Formal concept analysis; Three-way concept; Three-way rough concept

1 Introduction

The theory of three-way decisions (3WD), proposed by Yao [42], is an extension of two-way decision model with an added third option. The basic idea of 3WD is to classify a universal set into three pair-wise disjoint regions, called the positive, the negative and the boundary region, respectively. Corresponding to these three regions, one can build rules for making a decision of acceptance, rejection and non-commitment, respectively. Up to now, 3WD has received much attention in theory and applications [8, 9, 17, 18, 22, 43, 44].

Formal concept analysis (FCA) proposed by Wille [37] in 1982, is an order-theoretic method for the mathematical analysis of scientific data. The central notions of FCA are concept and concept lattice. A formal concept is determined by a pair of sets, that is, a set of objects (the extension) and a set of attributes (the intension). The set of formal concepts of a formal context forms a complete lattice called the concept lattice, which is the core structure of FCA. In the

* Corresponding author.

E-mail address: huiying1977@163.com(H. Yu), liqingguoli@aliyun.com(Q. Li).

Download English Version:

<https://daneshyari.com/en/article/6861613>

Download Persian Version:

<https://daneshyari.com/article/6861613>

[Daneshyari.com](https://daneshyari.com)