ATTRIBUTE SIGNIFICANCE, CONSISTENCY MEASURE AND ATTRIBUTE REDUCTION IN FORMAL CONCEPT ANALYSIS

C. Huang,* J. Li,* S.M. Dias†

Abstract: One focus of data analysis in formal concept analysis is attribute-significance measure, and another is attribute reduction. From the perspective of information granules, we propose information entropy in formal contexts and conditional information entropy in formal decision contexts, and they are further used to measure attribute significance. Moreover, an approach is presented to measure the consistency of a formal decision context in preparation for calculating reducts. Finally, heuristic ideas are integrated with reduction technique to achieve the task of calculating reducts of an inconsistent data set.

1. Introduction

Formal concept analysis (FCA) [39] tries to mine knowledge from a formal context (O, A, R). This kind of knowledge is a special structure called concept lattice that is constituted by formal concepts [39]. Up till now, FCA has gained applications which are knowledge discovery [3, 14, 23, 29], information retrieval [5], machine learning [11], cognitive learning [13, 17], software engineering [26, 28], and so on [31, 35, 41, 45].

Granular computing is a good theory to deal with problems by using the idea of granulation [42–44]. Recently, there have been some researches on granular computing approach of FCA. For example, Ma et al. [20] discussed the relationship between Galois connection and granular computing. Qiu et al. [24] established a concept granular computing system so as to contain as many types of concept lattices as possible in the same mathematical model. Wu et al. [40] examined the granular structures of concept lattices and demonstrated their application in attribute reduction. Considering that entropy theory can be used to solve problems

---

*Chenchen Huang, Jinhai Li -—— Corresponding author, Faculty of Science, Kunming University of Science and Technology, Kunming, Yunnan, PR China, E-mail: jhlixjtu@163.com, huangchenchen64@163.com,

†Sérgio M. Dias, Federal Service of Data Processing (SERPRO), Belo Horizonte, Minas Gerais, Brazil, E-mail: sergio.dias@serpro.gov.br