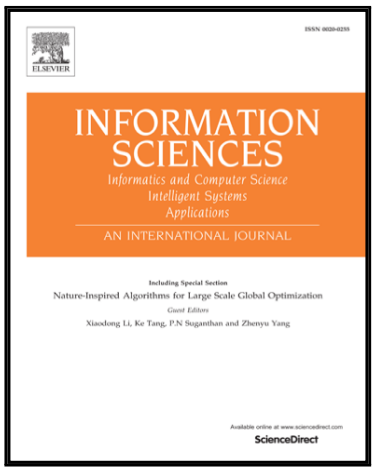

Canonical dichotomous direct bases

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Abstract

Closure systems are usually characterized in terms of implications. The directness property of implicational systems is a key issue in their computational usability. In this work we focus on this property, studying its connection with the structure of implicational systems and the design of methods for transforming any implicational system into an equivalent direct implicational system. We introduce a new paradigm based on the bipartition of the implicational sets into two components, according to their behavior wrt the closure. In addition, we present the notions of two new direct bases, named DD-basis and canonical DD-basis, also providing two methods to compute each of them. The advantages of the dichotomous approach will be shown both from the theoretical and empirical points of view.

Keywords: Implicational systems, closure systems, formal concept analysis, direct bases

1. Introduction

Closure operators play an outstanding role in a wide range of research areas including algebra, topology, logic, computer science, etc. It is well-known that a closure systems can be dually presented as sets of implications, called implicational systems. These notions are the pillars for several disciplines such as formal concept analysis (FCA) and lattice theory. Closure operators are systematically used in some important problems, which are solved with large/exponential methods. In the performance of these methods, closure computation has a direct