Title: Identifying Groups in a Boolean Algebra

Abstract

We study the problem of determining memberships to the groups in a Boolean algebra. The Boolean algebra is composed of basic groups (e.g., “J” and “K”) and the other groups that are derived from basic groups through the conjunction,disjunction, or negation operations (e.g., “J and K”, “J or K”, “not J”, etc.). All groups, basic and derived, are to be identified simultaneously based on the opinions of the potential members. Our main results are characterizations of (social decision) rules by means of independence axioms that are variants of Arrow’s independence of irrelevant alternatives. We report that any of these independence axioms, together with other fairly mild axioms, implies simple decision schemes that focus on a single fixed vote for every membership decision. These rules are characterized earlier in the binary and multinary group identification models by Miller (2008) and Cho and Ju (2015). We unify these two models and their main results. Our extended setup uncovers implicit constraints in the earlier studies. Dropping these constraints, as we propose, leads to quite a rich spectrum of rules. Among them are the consent rules by Samet and Schmeidler (2003).

JEL Classification Numbers: C0; D70; D71; D72 Key Words: multinary group identification; Boolean algebra; independence; con- sistency; one-vote rules