Reason-Based Choice for Groups

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1 Introduction

Rational choice theory typically assumes that a decision maker's preference is fixed, unchangeable, and without structure. Franz Dietrich and Christian List introduced an interesting rational choice model dropping these assumptions [5, 4].[1] The novelty lies in an explicit representation of the decision maker's motivational state. In this paper, we use this model to study problems in group choice. This provides a more subtle perspective on (dis)agreement in a group: If I prefer the blue circle because it is blue—i.e., my *reason* for preferring the alternative is its color—and you prefer the red square because it is a square, then we should both be happy with a blue square.

Our work shows that the addition of “reasons" to the representation of the preferences leads to interesting new issues in the theory of judgement aggregation. For instance, one conclusion is that unanimous agreement on an outcome x may not signal the end of the group decision problem since further deliberation may lead to an even better compromise outcome. On the standard picture, agents need to compromise *only if* they fail to reach unanimous agreement. On the new picture, agents may still want to compromise *even if* they can reach an agreement.

2 Property-based preferences

Suppose that X is a finite set, elements of which are the objects of choice. We use $\preceq$ (possibly with subscripts) to denote a rational preference ordering with $\prec$ de-

[1] See also [13, 8, 3, 12, 10] for closely related models.

noting the associated strict preference ordering and $\sim$ the associated indifference ordering (assuming standard properties, such as completeness and transitivity).

Our decision makers take into account different properties, or aspects, of the objects in X when forming a preference. A **property** is a subset of X. If $P \subseteq X$, then we write $P(x)$ if $x \in P$, and say that "x has property P". Let $\mathbb{P}$ be the set of properties of items from X. For simplicity, assume that $\mathbb{P} = \wp(X)$. In general, any collection of properties can serve as a **reason** for a decision maker, and different reasons may give rise to different preferences. If M is a reason (i.e., a set of properties), we write $\preceq_M$ for the preference ordering that is **based on reason** M. Following [5, 4], we assume that set of reasons forms a lattice: If M_1, M_2 are reasons, then so are $M_1 \cap M_2$ and $M_1 \cup M_2$. Let $\mathcal{P}$ denote the lattice of possible reasons. An **agent** is a tuple $\langle \mathcal{M}, \{\preceq_M\}_{M \in \mathcal{M}}, M_0 \rangle$, where $\mathcal{M}$ is a *sub-lattice* of $\mathcal{P}$ and for each $M \in \mathcal{M}$, $\preceq_M$ is a preference ordering, and $M_0 \in \mathcal{M}$. The reason M_0 represents the agent's "current motivational state". Let $\mathcal{M}_A$ denote the lattice of reasons for agent A (so, $\mathcal{M}_A = \mathcal{M}$) and $\preceq_A$ denote A's current preferences (so, $\preceq_A$ is $\preceq_{M_0}$).

In general, a reason M can be associated with *any* relation $\preceq_M$. However, it is natural to view the decision-makers as making property-based comparisons. [2] Suppose that $x \in X$ and M is a set of properties and let $M_x = \{P \mid P \in M \text{ and } x \in P\}$. Then, when comparing $x, y \in X$, the decision maker can compare the sets of properties M_x and M_y using a **weighing relation**, denoted by $\leq$ (a complete and transitive relation on $\mathcal{P}$). If $\leq$ is a weighing relation and M is a reason, then for all $x, y \in X$, let $x \preceq_M y$ if, and only if, $M_x \leq M_y$. In this case, y is (weakly) preferred to x for reason M when the properties from M true of y "outweigh" the properties from M true of x.

3 Aggregation, Agreement and Deliberation

The main goal of our paper is to use the model sketched above to study group decision problems. Incorporating *reasons* in models of preference aggregation turns

[2] The representation theorems from [5, 4] makes this more precise.

out to lead to interesting new distinctions not available in the standard model.[3] Our investigations proceeds along two main lines: First, we study and contrast different solution concepts to group decision problems, including various version of what we call *agreement* and *consensus*. And second, we study deliberation in group setting and the associated types of preference change.

A **profile** $\Pi = \langle A_1, \ldots, A_n \rangle$ is a finite sequence of agents. An **aggregation problem** is a tuple $\langle \Pi, \mathcal{O}(X) \rangle$, where Π is a profile and $\mathcal{O}(X)$ is the set of possible outcomes of the group decision problem. In this paper, we assume that the outcome of the group decision problem is a set of elements of X. That is, $\mathcal{O}(X) = \wp(X) - \{\emptyset\}$. The set $O \subseteq X$ that a group selects is the set of "best" or "acceptable" candidates. A **group decision** for a (group) decision problem $\langle \Pi, \mathcal{O}(X) \rangle$ is a tuple $\langle \Pi, O \rangle$, where $O \in \mathcal{O}(X)$.

Suppose that $\langle A_1, \ldots, A_n \rangle$ is a profile of agents. In general, any outcome $O \in \mathcal{O}(X)$ can be associated with Π. We are interested in identifying the "best" outcome to associate with a profile. There are two ways to make this precise: (1) There is **agreement** among the agents on a set of candidates O provided that for each $i = 1, \ldots, n$, the maximal elements according to $\preceq_{A_i}$ is among O; and (2) there is **consensus** among the agents on a set of candidates O provided that for each $i = 1, \ldots, n$, there is a reason M_i in A_i lattice of reasons such that the maximal elements according to $\preceq_{M_i}$ is among O. One conclusion of our analysis is that unanimous agreement on an outcome x may not signal the end of the group decision problem. In some cases, further deliberation may lead to an even better compromise outcome.

In our paper, we also develop a formal model of deliberation in group decision problems—cf. [11, 9, 7]. Suppose that $A = \langle \mathcal{M}, \{\preceq_M\}_{M \in \mathcal{M}}, M_0 \rangle$. As A deliberates about the aggregation problem $\langle \Pi, \mathcal{O}(X) \rangle$, her preferences may change as a result of any of the following:

1. A may become motivated by a different reason M_0';

2. A may incorporate a new property into her lattice of reasons $\mathcal{M}$; or

[3]This is in line with recent work incorporating reasons into the judgement aggregation framework [2, 6, 1].

3. The weighing relation $\leq_A$ may change.

The first type of preference change involves the agent moving within her lattice of motivating reasons and adopting the preference ordering associated with the new motivating reason. The third type of change to the agents involves a direct change to the agent's weighing relation. A study of preference change along these lines can be found in [8, 3]. Also, in the full paper we explores the relationship between this approach to changes in preferences with dynamic logics of preference (cf. [8]).

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