

Research Proposal: Electing Committees

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1 Introduction

Extensive work has been done to expose and analyze the flaws in common single-candidate election procedures. Arrow's Theorem states that there exists no perfect voting procedure, so the existing research serves to compare and analyze existing voting systems as well as propose new systems. The problem of electing committees is clearly more complex; less research has been done to investigate the behaviors of voting procedures for committees. One particular complexity is that in a committee election, the voting procedure should respect the voters' preferences on the committee as a whole as well as on the individual candidates.

Thomas Ratliff [1] argues that the optimal voting procedure for electing committees asks voters to produce a full ranking of all possible committees and to score the votes using a Borda count. Unfortunately, the number of possible committees can easily be large enough so that a full ranking is impractical to produce; also, voters often readily identify their top and bottom choices, leaving the middle rankings to nearly arbitrary decision.

2 Proposed Research

I plan to study various voting procedures by analyzing them from an algebraic perspective. Possible voting procedures of interest are partial ranking procedures and approval-like frameworks. Partial rankings would ask voters to only rank a certain number of possible committees, e.g. only the top and bottom rankings. Approval-like frameworks would ask voters to indicate of which subsets of candidates they approve. Research on these methods would include an analyzation of how to score the votes, and how different scoring methods might produce different results. This research is in pursuit of a voting procedure which is minimally susceptible to manipulation while respecting voters' preferences on the committee as a whole.

3 Prior Research

Existing research on electing committees has been done by Ratliff [1] [2], Bock et al. [3], and Brams et al. [4]. Significant work on voting theory has been done by Saari [6], and an algebraic interpretation of Saari's work has been done by Daugherty et al. [5].

I have completed courses in Abstract Algebra and Representation Theory, supplemented by [7] and [8].

References

- [1] T. C. Ratliff, *Selecting Committees*, Public Choice, 126.3-4 (2006) pp. 343-355.
- [2] —., *Some startling inconsistencies when electing committees*, Soc Choice Welfare, 21 (2003) pp. 433-454.
- [3] H. Bock, W.H.E. Day, & F.R. McMorris, *Consensus rules for committee elections*, Mathematical Social Sciences, 35 (1998) pp. 219-232.
- [4] S.J. Brams, D.M. Kilgour, & M.R. Sanver, *A minimax procedure for electing committees*, Public Choice, 132 (2007) pp. 401-420.
- [5] Z. Daugherty, A.K. Eustis, G. Minton, & M.E. Orrison, *Voting, the Symmetric Group, and Representation Theory*, American Mathematical Monthly, 116.8 (2009) pp. 667-687.
- [6] D.G. Saari, *Explaining all three-alternative voting outcomes*, Journal of Economic Theory, 1999.
- [7] D.S. Dummit & R.M. Foote, *Abstract Algebra*, Prentice Hall Inc., Englewood Cliffs, NJ, 1991.
- [8] G. James & M. Liebeck, *Representations and Characters of Groups*, Cambridge University Press, 2001.