Arithmetic Social Choice:
Arrow's Theorem and Single Peaked Preference

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Abstract

We construct an algebraic model of the social choice theory. First we give an arithmetic proof of Arrow's Impossibility Theorem. Next we apply our algebraic method to single-peaked preference domain to establish two theorems. (i) A value of Arrovian social welfare function on single peaked preference domain is single-plateaued with at most two maximal elements. (ii) An ordering by majority voting is identical with that by Arrovian social welfare function under the assumptions Anonymity and Covariancy (weaker version of May's Neutrality).

Key words: Arrovian social welfare function, single-peaked preferences, majority voting, arithmetic in a finite field

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