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Extension of Spatial Theory for At-Large Elections Through Analysis and Simulation

In this dissertation we will analyze the proximity spatial models for cumulative voting. We will show that the cumulative voting method, with its plumping strategy, provides a greater chance of minority representation in the elected body than often occurs in multimember districts elected by plurality. Using our cumulative voting heuristic, we identify conditions necessary for a Nash equilibrium to exist when voters' ideal points are normally distributed with $\mathcal{N}(0,1)$. We will show, through a proposition and proving it, than under our cumulative voting heuristic, candidates tend to adopt centrifugal positions, away from the median voter. With this in mind, we will place two candidates away from the median, on the opposite sides, and investigate conditions necessary for a Nash equilibrium to exist. We will accomplish this by first placing a third candidate within an ϵ neighborhood of either of the other two candidates and then let him assume positions anywhere on R^1, the single predictive dimension space. From the first analysis we will develop an equation whose solutions provide the only possiblity for a Nash equilibrium to exist. Using Numerical Analysis techniques we will approximate those solutions by a nice elementary function whose properties we know. From the second analysis, we will derive mathematical models which we analyze to establish intervals of β for which a Nash equilbrium exists. We will then extend our analysis to a more plausible distribution for the cumulative voting method, the "double Normal" distribution. The problem model we developed in this case will be very complex and hence necessitate analysis via simulation. Through this simulation model we will illustrate the electoral potential of cumulative voting to yield fair representation when plurality voting does not.