

Augmenting Borda Count to Instant Runoff


BY: EVAN LIANG

Borda Runoff

Eliminates candidates based on the Borda Count

How to Fill Out Cary's New Ballot: Mark a Different Candidate for Each Choice

For TOWN COUNCIL AT LARGE - One Seat			
Fill in one oval per choice	Your 2nd or 3rd choice will be considered if your 1st choice loses		
VOTE for your 1st choice here	1st ↓	Mark your 2nd choice here ↓	Mark your 3rd choice here ↓
Benjamin Franklin	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thomas Jefferson	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Betsy Ross	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Write-in: _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



For more information, see
www.CaryVotes123.com
or call Wake Co Board of
Elections at 856-6240

Mark your 1st choice, then you may mark 2nd and 3rd choices as back-ups. Your back-up choices will never hurt your 1st choice. Back-up choices are only reviewed if an "instant runoff" occurs and your first-choice candidate gets eliminated and is not in the runoff.

Motivation

- I like runoff voting systems, but monotonicity is also unbearable
- Variations of instant runoff
- Measuring monotonicity

Properties of BRV

- Trivial: Satisfies anonymity and neutrality.
- Nontrivial: satisfies the majority criterion.
- Does not satisfy monotonicity and CWC

Lemma about Borda count

If a candidate receives the majority of first place votes in an election, then that candidate cannot be last place under Borda count.

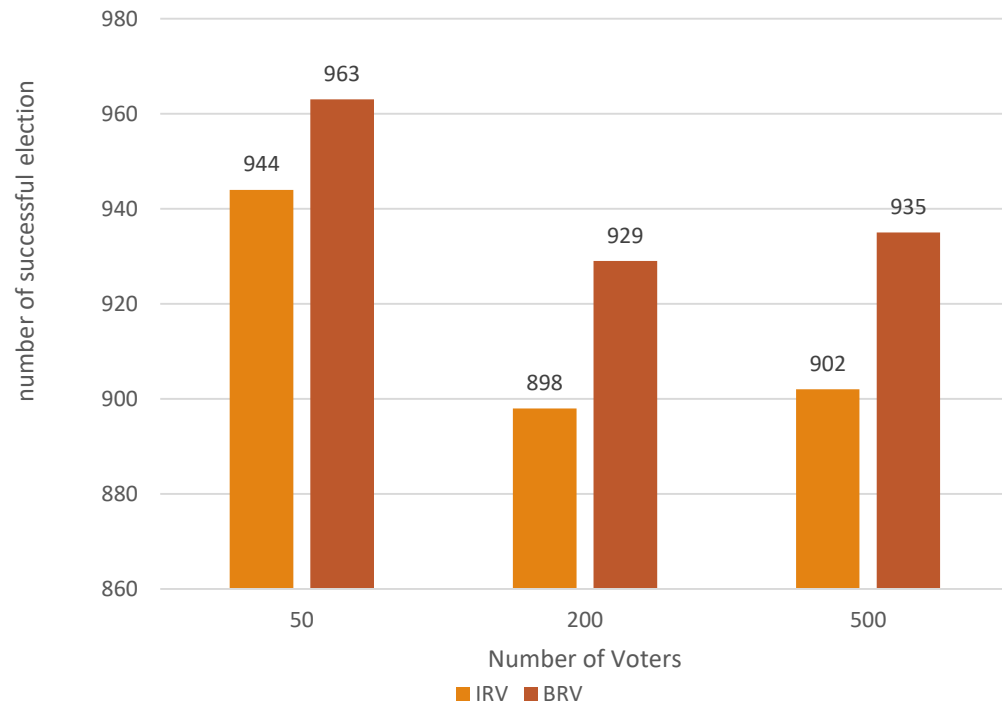
Monotonicity

Winner Vulnerability: an election is vulnerable if increasing the winner's ranking on some individual preference orders results in a new winner.

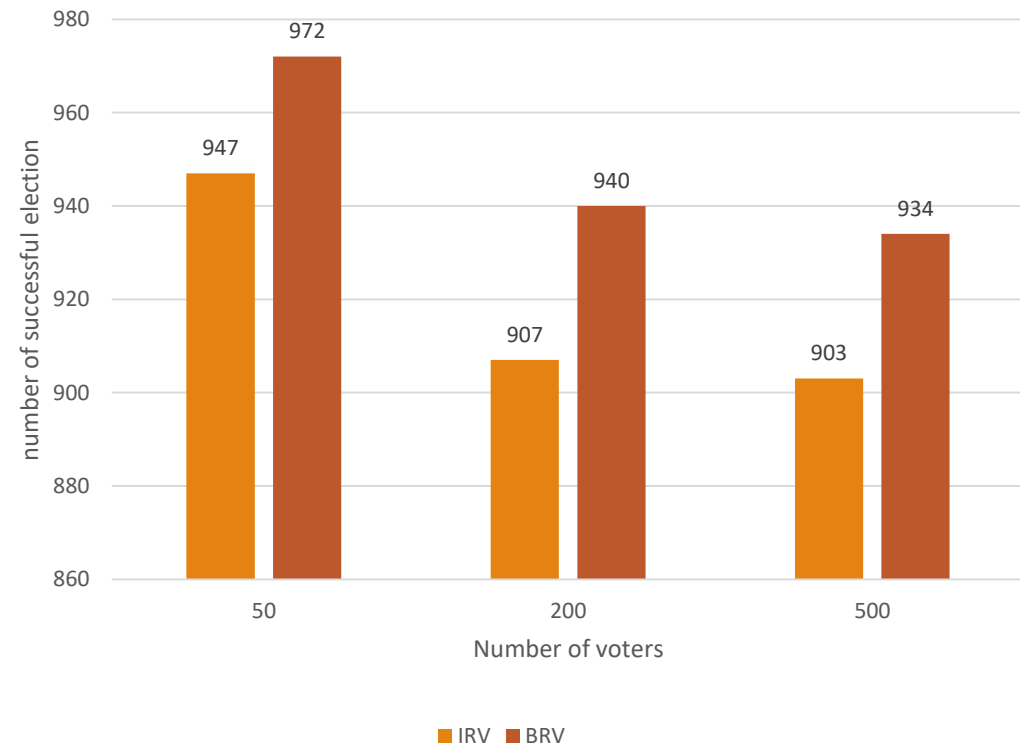
General Vulnerability: an election is vulnerable if we can find a candidate whose ranking on the societal preference order is lowered when its ranking is increased on some individual preference orders.

Results – 3 candidates

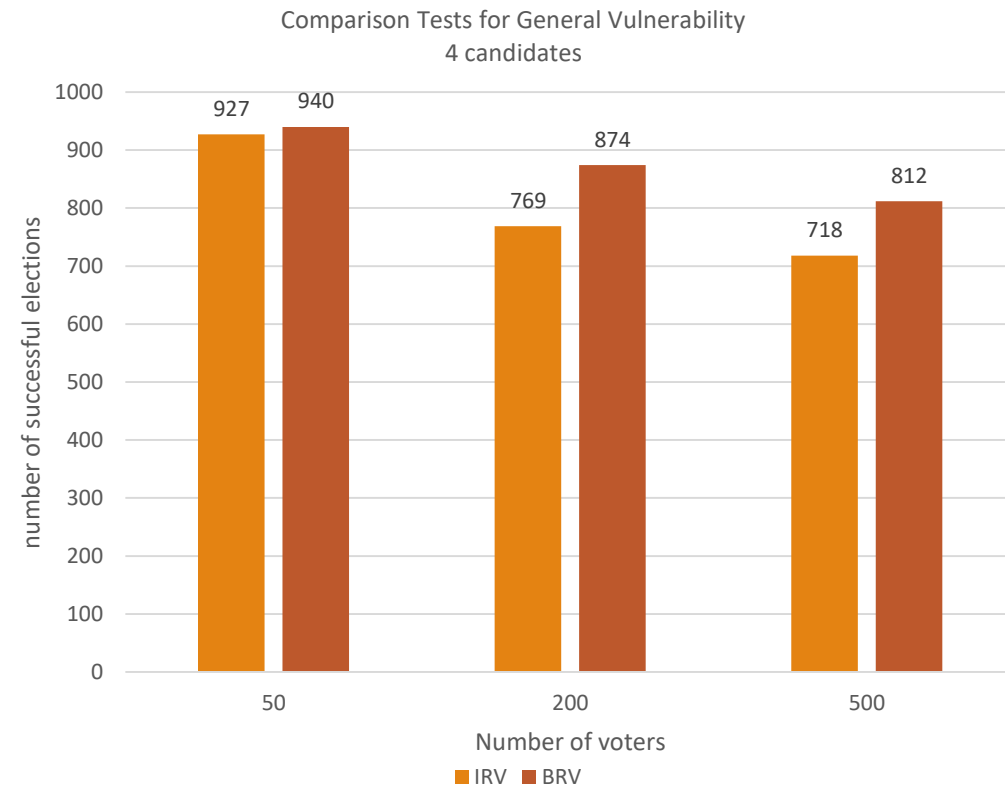
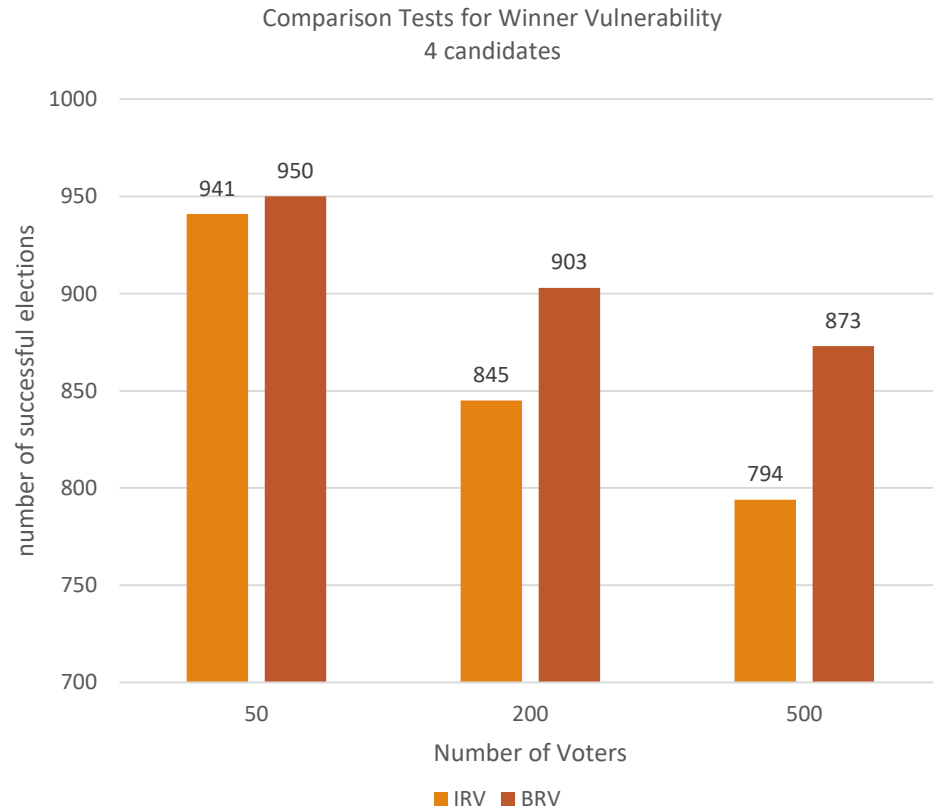
Comparison Tests for Winner Vulnerability
3 candidates



Comparison Tests for General Vulnerability
3 candidates



Results – 4 candidates



Results – cont.

BRV performs better than IRV in every test.

Question: if an election passes the vulnerability test for IRV, does the same election pass the test for BRV?

Answer: NO

References

Jonathan K. Hodge and Richard E. Klima. *The Mathematics of Voting and Elections: A Hands-on Approach*. The Mathematical World, Volume 22, 2005

Nicholas R. Miller. *Monotonicity Failure in IRV Elections With Three Candidates: Closeness Matters*. University of Marland Baltimore County, 2016

Dominique Lepelley, Frederic Chantreuil, and Sven Berg. *The likelihood of monotonicity paradoxes in run-off elections*. Mathematical Social Sciences, 31, 1996