Whose Vote is it Anyway?
Tenets for Interpreting Votes

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Abstract

The mantra of many voting integrity advocates is that subjectively hand counting paper ballots is necessary to accurately assess voter intent. In this paper, we reveal the underlying issues and several applicable obscure principles that are not well understood in this debate. Our main contribution is a set of tenets that can be immediately applied in making voting system policy decisions.

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1. Introduction

One lesson of the Florida Presidential election of 2000 is that interpreting votes cast on physical ballots can be extremely contentious and highly partisan processes where nonscientific metrics such as "fairness" and "clarity" replace scientific terms such as "proportionally" and "consistently" for counting votes. We present and defend several scientific axioms or tenets for vote interpretation that can return these processes to scientific foundation in precision and consistency. The following exemplify our scientific vote interpretation tenets.

- Only the voter knows their intent.
- The meaning of an undefined mark is, by definition, undefined.
- Intent is best captured by precise rules that are properly followed.
- Non-standard ballot marks cannot precisely reflect a clear intent.
- If a vote is clear enough to count, it must be included on the first tally.
- If you measure by an imprecise standard, you guarantee an imprecise measurement, and the measurement's imprecision is directionally proportional to the standard's imprecision.
- If human interpretation is required to decide whether votes are legal or not, close elections will necessarily be decided probabilistically; that is, like flipping a coin.
- 'Clear' is in the eyes of the beholder. If a rule cannot be interpreted by a machine, it is subjective and probabilistic at best; arbitrary at worst.
- Do no harm!" Interpreters can cause a vote to be misdirected to an opponent.
- Votes are discrete (Boolean) values, while intent occurs in a continuum.

In this paper, we offer observations and arguments that we believe can form a sound scientific foundation for policies and processes for interpreting votes. Our discussions focus on non-standard, undefined ballot marks on voter-marked ballots, recognizing that user interface and ballot design also play important, but separate, parts in capturing voter intent.

2. Critical Assumptions Underlying Attempts to Interpret Voter Intent

Voting is designed to be a one-way process where voters translate their ideas into candidate selections or choices on ballot initiatives. Most of the time, vote counting is objective (can be machine counted) or at least straightforward (can be precisely human counted). However, some states require extreme measures to examine nonstandard marks to attempt to determine voter intent, which is, in some sense, a backwards process. We describe several assumptions that found attempts to conduct the unnatural, reverse engineering process of discerning voter intent from a human marked ballot.

2.1. Only the Voter Knows Their Intent

People's thoughts reflect their most fundamental privacy and our only absolute privacy right. No person or authority can know our deepest thoughts. Fortunately, this is one privacy right that even advanced technology has not invaded. Only we know our thoughts, motivations, and intentions.

When combined with the universal voting system requirement to retain voter anonymity, this tenet ensures that any attempt to interpret voter intent is only a non-scientific approximation.

2.2. Marks on a Ballot May Not Reflect A Clear Intent

The most critical assumption in the attempt to interpret voter intent is often unstated and its application is fundamentally ambiguous. Every ballot mark is not necessarily founded by a clear intent. As an illustration we show that fundamentally different intents may logically result in identical markings, so a reverse mapping (from the mark to an intent) is necessarily probabilistic, which leads to our first tenet:

- If human interpretation is required to decide whether votes are legal or not, close elections will necessarily be decided probabilistically.

Consider first that a properly marked vote may mean:

1. I know this person and want to cast my vote for them
2. I know this person's party and I want to cast my vote for them
3. I don't know anything about this person and want to cast my vote for them
4. I don't really care who I vote for, I just want to cast a vote because it is my right
5. I don't really care who I vote for, I am casting a vote because my son brought me
6. I don't really care who I vote for, gathering at the polls is a social thing for me
7. I don't really care who I vote for as long as it isn't a particular candidate

Because the interpretation for properly marked ballots is uniformly well-defined, there is no need to consider the intentions underlying properly marked selections. This is good.

On the other hand, a circled bubble, circled candidate name, x'd bubble, checked bubble, dotted bubble, and many other alternate markings may also manifest from multiple, different intents, including all of the above (1 - 7) and the following additional examples:

8. If I were going to cast a vote, it would be for this candidate.
9. I want to vote for a candidate by this name, but I think it is in a different race
10. I seem to recall this candidate but don't recall the details; I'll come back later and mark a proper vote if I remember more.
11. I would have voted for this candidate if they were not a [1]XINO.
12. I would never vote for this candidate.
13. My spouse recommended this candidate, but I'm not sure about voting for them.

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[1] Member of party X In Name Only. Refers to party members that do not hold strongly to the party platform.

You can likely think of many other possible meanings that alternative markings may represent, maybe even some that you have experienced. The above list is not intended to be all inclusive, but it illustrates the difficulty in projecting intent onto a ballot mark, particularly one that is not well-defined. This difficulty does not occur by chance; rather it is a result of the natural properties of voter intent, for example, those that are reflected in another tenet:

- Votes are discrete (Boolean) values while intent occurs in a continuum.

Voter intent is rarely absolute. Even the most fervent politicos lack information about candidates and ballot issues or share favor across issues and candidates. Voters must translate their continuous intent value into a discrete vote. It is axiomatically true that it is impossible to precisely reverse engineer that discreet vote into its precise intent; the marks cannot contain enough information. Worse yet, it is difficult to empirically study this impact, as reflected in the following tenet:

- Anonymity limits empirical examination of voter intent in nonstandard markings.

Proponents of "voter intent" rules may argue that statistical and probabilistic methods overcome the lack of precise voter intent, or discount the percentage of such nonstandard intentions. There is no scientific foundation for such speculation. Since ballots are anonymous and the vast majority of ballot marks are legally marked or are left unmarked and because votes are cast anonymously, there is no scientific way to evaluate voters that make non-standard marks. There is no way to duplicate, or even approximate this voting population in a way that could gather a statistically significantly target population. Thus, the best that an interpreter can do is to issue personal opinion, thus:

- Intent is best captured by precise rules that are properly followed.

Properly executed marks should be the gold standard and should always dominate other marks.

It is easy to understand how having an infinite number of potentially legal marks can cause confusion and imprecision. Thus, many states create an arbitrarily large set of prescribed, yet nonstandard, legal vote marks. Unfortunately, it is axiomatic that voters cannot accurately express their intent if they do not understand the interpretation rules, as reflected in the following tenet:

- All interpretation rules must be precisely predefined to the voter before they cast a vote.

Its corollary also applies:

- The meaning of an undefined mark is, by definition, undefined.

If a voter cannot understand the rules, the intent of their marks will be necessarily unclear. Smaller rule sets can be universally easier for voters to understand than large rule sets and no comprehensive rule set can possibly be established. If one could, it could not be understood.

2.3. Subjectivity and Accuracy

The power of human reasoning is in the ability manage heuristics, or rules of thumb that guide intuition. These heuristics are uniquely acquired and form distinctive human personalities, allowing different people to be presented the same information, yet come do different assessments. Subjective decisions are frequently guided by heuristics.

Machines, on the other hand, excel in making repetitive, deterministic decisions that are axiomatically repeatable. Determinism means that the same input will necessarily result in the same output. Objective decisions may be effectively implemented with deterministic processes.

For this reason, objective criteria are axiomatically more precise than subjective criteria. Subjectivity requires perspective and context that may or may not be shared between the voter and the interpreter. The greater the subjectivity, the greater the imprecision. This leads to our next tenet:

- If you measure by an imprecise standard, you guarantee an imprecise measurement, and the measurement's imprecision is directionally proportional to the standard's imprecision.

A canonical example that illustrates this concept is to measure an area (say a room) with a measuring standard that is *about* a yard long. The total imprecision of the measure is a factor of the number of iterations that the standard is applied.

In some situations the imprecision may not matter. For example if the standard used to measure a room is a bit shorter than a yard, we may order slightly more carpet than we really need, necessitating trimming the edges at installation time. On the other hand, if our standard is too long, it may be more difficult to remedy the imprecision.

The problem is exacerbated with vote interpretation since there is no way to go back and re-measure the room, i.e. there is no way to ask the voter what they meant. The corresponding result in our carpet example, would mean that we would either be forced to install too much, or to little carpet depending on our original measure's imprecision.

If officials cannot define legal vote rules with sufficient precision that a machine can deterministically interpret them, we posit that no scientific foundation allows rules to be sufficiently precise that humans can deterministically interpret them when humans are inherently non-deterministic. The prevailing opinion among human interpretation appears to be that human non-determinism can be offset by group therapy, essentially that a group of interpreters can overcome individual bias. This non-scientific perception discounts the impact of groupthink and the natural ideological loyalties that permeate elections.

The only way to prevent this canonical imprecision is to ensure that the marking standard and the interpretation rules are precise and that the two are closely correlated, leading to the following tenet:

- Capture capabilities of any vote interpretation engine should map precisely to the manifestation capabilities of the marking system, else imprecision is engineered into the system.

We might be able to mitigate or limit the negative impacts of subjective evaluation standards if we could isolate them to a limited portion of the system. Unfortunately, once subjectivity is introduced, it naturally pervades or overtakes the decision process. Like adding salt to a bucket of water, you may later add more water, but there is no way to restore the mix to its pristine state. As our tenet states:

- Subjectivity is self-perpetuating

We illustrate with one example of a side effect of granting legal status to non-standard marks.

If a voter selects one choice with the standard mark and a different choice with a non-standard mark, is the outcome an overvote?

A canonical circumstance that could lead to this situation is for a voter that is indecisive to circle their preferred choice on the first pass and return to the contest to make their final selection later. In this case, granting non-standard rules legal vote status would result in disenfranchising this voter.

There are approaches to subjectively resolving conflicts. These processes focus on achieving:

Harmony rather than accuracy

Agreement rather than precision

Consensus rather than correctness

Elections demand accuracy, precision, and correctness. Since those properties are consistent with deterministic processes, elections should be driven by objective voting systems.

2.4. Whose Vote Is It Anyway?

There are many implications of the "One person, one vote" election standard. One fundamental notion it captures is that the vote MUST be that of the voter. Insidious attacks such as vote selling and voter coercion violate this rule and threaten election integrity. Similarly, if an interpretation system transfers the ultimate decision on how a vote is counted from one person to another, the

resulting vote is that of the interpreter rather than the voter that cast the ballot. This leads to the following tenet:

- If an interpreter can influence how a vote is counted, then it isn't the voter's vote.

Certainly, election integrity advocates goal is to ensure that voter's actions result in a counted vote. Unfortunately, subjective rules can cause interpreters to violate the following fundamental tenet of well-intentioned servants:

- Do no harm.

When considering vote interpretation, we often relate to our experiences as students. When we took tests, we expected (or hoped) that teachers would give us the benefit of the doubt, assuming more content than our answers reflected or projecting greater clarity when our answers weren't as clear or precise as they should have been. Regarding voting systems, our misplaced intuition is that voters deserve even greater benefit of the doubt and that we should project our opinion regarding their intent when necessary. Unfortunately, the test question analogy does not correspond to voting for many reasons, two of which are:

(1) We cannot correlate a ballot to a voter as we can with a test in school and

(2) Subjectively awarding the benefit of the doubt can do harm rather than good

On a test, giving the student the benefit of the doubt can only result in a benefit to the student. When interpreting a vote, it is possible to accidentally negate or even reverse the voter's intent. At its worst, subjective vote interpretation rules can result in a vote intended for one candidate/choice to be awarded to another candidate/choice, leading to the next tenet:

- Do not interpret my ballot as being cast for my opponent!

Incorrect vote recording need not be possible if precise standards exist.

We must also consider that not all interpreters are election integrity advocates. As we know, election results often have wide-ranging implications. Elections for state-wide or federal offices carry national importance and generate national interest. Interpreters in such instances are often solicited and selected by lawyers hired to advocate for their client, who is routinely one of the candidates.

This political reality results in adversarial situations where election integrity and voter intent gives way to candidate advocacy, where the goal is to win and the means to that goal may naturally diverge from the altruistic goal of election integrity. This notion that is reflected in this tenet:

- Introducing arbitrary interpretation rules injects the opportunity for organized efforts to create doubt.

2.5. Acceptable Disenfranchisement and The Stopping Rule: Where Does It End?

While we prefer to believe that the title of this subsection is a contradiction in terms, that is, there is no such thing as Acceptable Disenfranchisement. Of course, nothing is perfect. In elections, that means there will be voters that unintentionally cast illegal, unintelligible votes, thus, the debate naturally regresses to an optimization problem that is guided by principles and axioms that dictate tradeoffs relative to precision and efficiency. One such optimization purports to accept imprecision in the first count, but demands increased precision in subsequent counts, effectively disenfranchising voters that cast imprecise, yet legal votes in more than 99% of elections. This is unacceptable and leads to the following tenet:

- Every legal vote must be counted in the first count.

Defining rules that cannot be interpreted by machines opens Pandora's box of subjective rules that has no precise or natural bounds. For example, we have recently seen proposed state rules to establish valid votes in Florida that read:

Wording Example #1: The voter draws a diagonal, horizontal, or vertical line, *any portion of which intersects two points* on the box or oval and which does not intersect another box or oval at any two points.

Wording Example #2: The voter draws a diagonal or vertical line that intersects an *imaginary line* extending from the center of the head of a single arrow to the center of the tail of the same arrow, provided the diagonal or vertical line does not intersect the imaginary line joining the head and tail of another arrow.

In the former, should an interpreter accept a mark that almost, but does not quite, intersect a bubble on one side? Certainly so, if capturing voter intent is the gold standard. Thus, the rule should be worded so that lines ending close to the second intersection should also be accepted. Then, what if both ends are close, but neither end intersects the bubble? There is no natural stopping point, leading to the following tenet:

- All subjective vote interpretation rules are fundamentally arbitrary.

In the latter wording example interpreters are required to estimate the location of an imaginary line in order to interpret some votes. Precisely interpreting anything imaginary is impossible.

Both of these wordings reflect the tendency for humans to shun deterministic rules that can be precisely or mechanically realized in favor of heuristic rules that require context and intuition of the interpreter. We have strongly argued that heuristics necessitate imprecision and further argue that deterministic rules facilitate precision, consistency, and confidence. We strongly argue that when laws require that heuristics be applied, they must be applied consistently, and on every count.

- If "voter intent" laws require non-determinism, there must be a deterministic way to identify non-deterministic ballots and they should be resolved and recorded in the first count.

3. The Impact of Non-standard Ballot Marks on Anonymity

One widely accepted requirement of all voting systems is that they must preserve voter anonymity. That is, the voting act itself must be private and there must not be any way to connect a ballot to a voter after the ballot is cast.

The elephant in the room relative to interpreting voter-marked ballots is the impact that accepting non-standard marks as legal votes has on vote selling and voter coercion. If large subsets of non-standard marks are allowed to reflect legal votes, voters have a virtually unlimited number of unique ways to sign ballots by marking them in a way that no other voter is likely to duplicate.

When combined with transparency laws that require ballots to be made public, ballot signatures can allow corrupt employers to coerce employees to vote a certain way and to verify that they followed instructions and can facilitate dishonest voters confirming their vote to a vote buying agent.

4. Conclusion

The move towards subjective vote interpretation standards naturally evolves from the desire to count every vote if at all possible. Unfortunately, this well-intentioned practice has unintended side effects and makes the vote counting process unnecessarily inaccurate.

In this paper, we present and defend a group of axiomatic rules to return vote interpretation processes to a scientific foundation. The basis of these axioms is that voter intent is known only to the voter and attempts to interpret votes beyond a simple, published standard necessarily injects imprecision and guarantees controversy and arbitrary selection in close races.

Moreover, accepting non-standard marks as legal votes provides an avenue for insidious anonymity violation and vote fraud in the form of vote selling and voter coercion. We see this as an unnecessary tradeoff. We strongly encourage election policies that facilitate deterministic vote interpretation and scientists to focus on technology that provides rigorous voter selection to vote count audit trails. Specific comments on Preliminary Draft rule 1S-2.027 are included as Appendix A.

Appendix A: Comments on Preliminary Draft rule 1S-2.027