Machine Retabulation is not Auditing

Mark Lindeman, Ronald L. Rivest[*], and Philip B. Stark[†]

24 March 2013

- A **post-election vote tabulation audit** checks election results by manually inspecting some voter-verified records (usually paper ballots). A well-designed audit can produce strong evidence that election outcomes are correct—and can correct incorrect outcomes.

- The principle of **evidence-based elections** says that an election should provide convincing evidence that election outcomes are correct. True audits allow observers to see directly how well the voting system performed, which can provide such evidence.

- Some claim that election results can be checked by **machine retabulation**, in which ballots are rescanned on other equipment. Machine retabulation may happen to catch some errors, but it is not really an audit. Machine retabulation relies on the false assumption that two machines can't *both* be wrong.

- Some claim that retabulation adequately checks the voting system because it is "independent" of the voting system. But a retabulation system could be misconfigured in the same way as the voting system, could misinterpret some ballots in the same way, or could be subverted to cause it to report the same incorrect results. Two unaudited machine counts are not necessarily better than one.

- Some claim that retabulation can adequately check the voting system results provided that the two sets of vote counts match in sufficient detail. This is like claiming that if two expense reports list the same expenses, both must be right and there is no reason to look at any receipts.

- Some claim that retabulation itself can be "audited" by comparing ballot images produced by the retabulation system with the system's interpretation of those images. At best, this tests internal consistency: whether two parts of the retabulation system agree with each other. It does not test whether the system correctly interpreted the ballots. At worst, a subverted retabulation system could pass this test, yet misreport *every* vote. This is not an audit. It cannot confirm that the election outcome is correct.

- A well-designed retabulation system can help in a **machine-assisted audit**. In a machine-assisted audit, the retabulation system produces an interpretation of votes on each ballot (a Cast Vote Record, or CVR) that can be matched with that ballot. The CVRs are exported from the retabulation system. Observers verify that these exported CVRs produce the same electoral outcome (winners, etc.) as the voting system. Then observers compare a random sample of actual ballots against the corresponding CVRs. *This comparison is between actual ballots and CVRs, not between digital images of ballots and CVRs.* A machine-assisted audit can produce strong evidence that election outcomes are correct. Retabulation cannot, even if the CVRs are checked against the digital images of the ballots.

- There is currently no way to audit votes cast online, and there is little prospect for the foreseeable future. Despite claims about "military grade encryption," Internet voting does not create a durable, voter-verifiable record against which the results can be checked. While votes cast on the Internet could be retabulated, they cannot be audited. Both NIST and the Department of Homeland Security agree that secure online voting does not currently exist, and—if it is possible at all—is a long way off.

_____

* Viterbi Professor of Electrical Engineering and Computer Science, MIT

† Professor, Department of Statistics, University of California, Berkeley