# Internet Voting–Seriously??

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# Outline

Introduction

Technology evolution and voting

Internet voting

Security

Risk assessment

# New tech for old applications

One often asks if new technology can improve existing applications...

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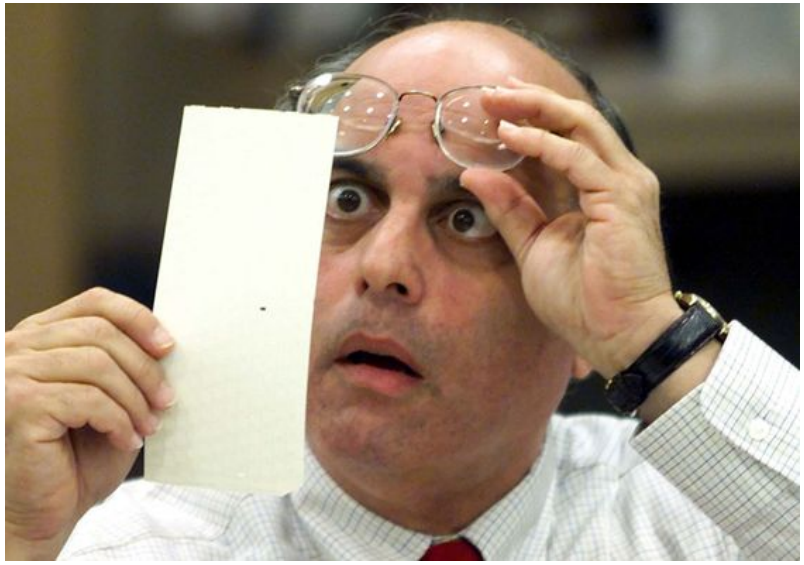
Example: punch cards for voting



Step forward... or a mistake?

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# Sometimes new tech helps

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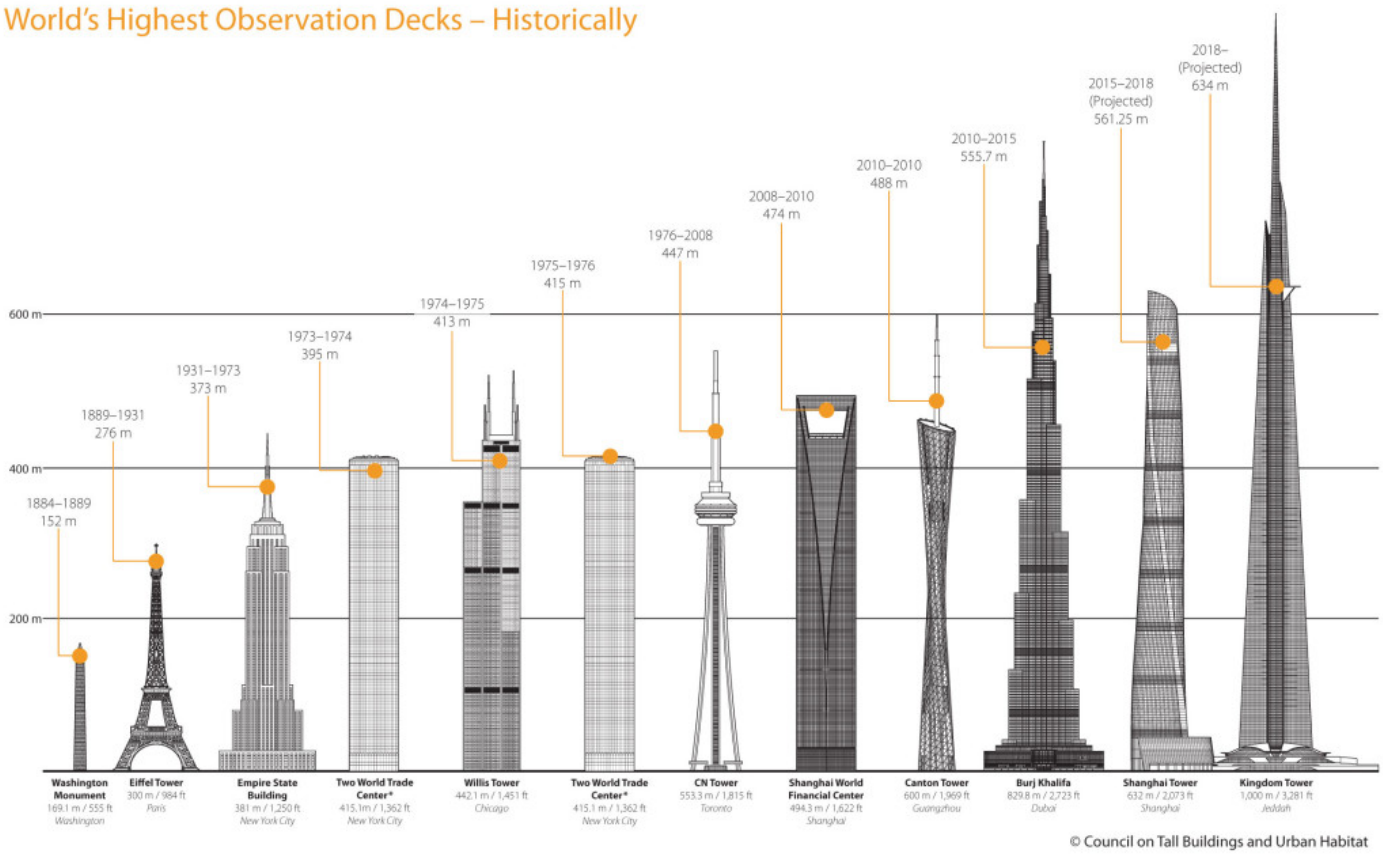


Electric motors → elevators → tall buildings.

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# Sometimes it doesn’t, or is silly.

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# Sometimes it is too dangerous for some uses!

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(Don’t text while driving!)

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But... actually voting over the Internet????

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# What is “Internet Voting (IV)”?

Internet voting is a form of remote voting.
Remote voting has many flavors:

- Ballots sent to voter by: mail | web | email
- Ballots are: paper | electronic | both
- Voters are: supervised | unsupervised
- Ballot “marked” by: voter | kiosk | voter PC
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- **A:** Because voting must work in an *adversarial* environment. You wouldn't get a man on the moon if people were trying to sabotage the launch and shooting at the rocket.
- **Note:** Adversaries may be outsiders, or insiders. A foreign nation-state is a *likely adversary*.

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# Voting must provide a *secret ballot*

- **Q**: If we can bank online, why can't we make online voting work?
- **A**: Banking is not anonymous, so you can have identifiable receipts. Furthermore you can "undo" a bad banking transaction. Finally, bankers spend *lots* of money on security.

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  NIST: “additional research and development is needed to overcome these challenges before secure Internet voting will be feasible.” (No timeframe provided. No existing standards for IV.)
- NIST is being diplomatic. Secure Internet voting may in fact be an *unsolvable* problem.

# Some may say “Adversary won’t attack”

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- Home Depot ($83B revenues in 2015) was hacked in 2014, disclosing 56 million credit card numbers. This week they agreed to pay $19M in fines; they expect to lose as much as $160M via lawsuits.

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- Recently Juniper Systems ($4B revenue 2014) found its source code had been hacked by unknown parties, leaving a “backdoor”.
- It may be months or years (average around 18 months) before a company even realizes it has been hacked.

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- Now the standard working assumption is more realistic/pessimistic:

  *If you are online, you will be hacked (or already have been). "Assume the breach." Can you deal with it? Or even detect it?*

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- Security budgets for most election jurisdictions are miniscule.

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- With IV, you are asking a machine or online server to be your “proxy voter” and vote for you.
- If one machine proxies for millions of voters, you have a large risk if proxy is hacked. (And as we saw, we should assume that server has been hacked!)

# Remote voting already has known security problems

- Unsupervised remote voting vulnerable to vote-selling, bribery, and coercion.

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- Paper ballots and "end-to-end verifiable audit logs" are two useful evidence-producing methods.

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- We can't make such technology appear by wishful thinking, just trying hard, making analogies with other fields, or running pilots.
- It is irresponsible to assume that determined effort by an adversary won't defeat IV security.

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# Helios

- Best internet voting system I know: “Helios” by Ben Adida (former PhD student of mine).

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- Best internet voting system I know: “Helios” by Ben Adida (former PhD student of mine).
- Ben says firmly, “A government election is something you don’t want to do over the Internet.”

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# Technology abuse

- Some folks are just be a bit too infatuated with the latest tech...

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- Some folks are just be a bit too infatuated with the latest tech...
- They ask,

  “What are best practices for internet voting?”

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# What is the best way to play in traffic?

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# What is the best way to become roadkill?

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# Internet Voting Summary

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*Wargames (1983)*:

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"Sometimes the only winning move is

# Internet Voting Summary

*Wargames (1983)*:

"Sometimes the only winning move is *not to play*."

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# We don’t need to play in traffic!

(Footbridge = paper ballots)

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# Moving forward...

- Many people seem to want to “vote on the Internet” (why?????)
- Most don’t recognize the severe security problems it entails
- More research is reasonable (e.g. could a blockchain help??),
- But one shouldn’t expect near-term (10-year) “solutions”
- Indeed, this isn’t the kind of problem that has a “solution” preventing security breaches; one rather needs good procedures for dealing with the certainty of getting hacked and dealing with DOS attacks.

# The End

# What about “end-to-end” internet voting?

An “end-to-end” voting system provides additional auditing capabilities for voters and others to detect when the election has “gone awry.”

Without paper ballots, an E2E voting system doesn’t provide much in the way of a recovery mechanism to determine and restore the correct election outcome once a problem is detected.

Nonetheless, the recent U.S. Vote Foundation report on internet voting recommends that E2E voting properties are *necessary* (but not sufficient) for internet voting systems.

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