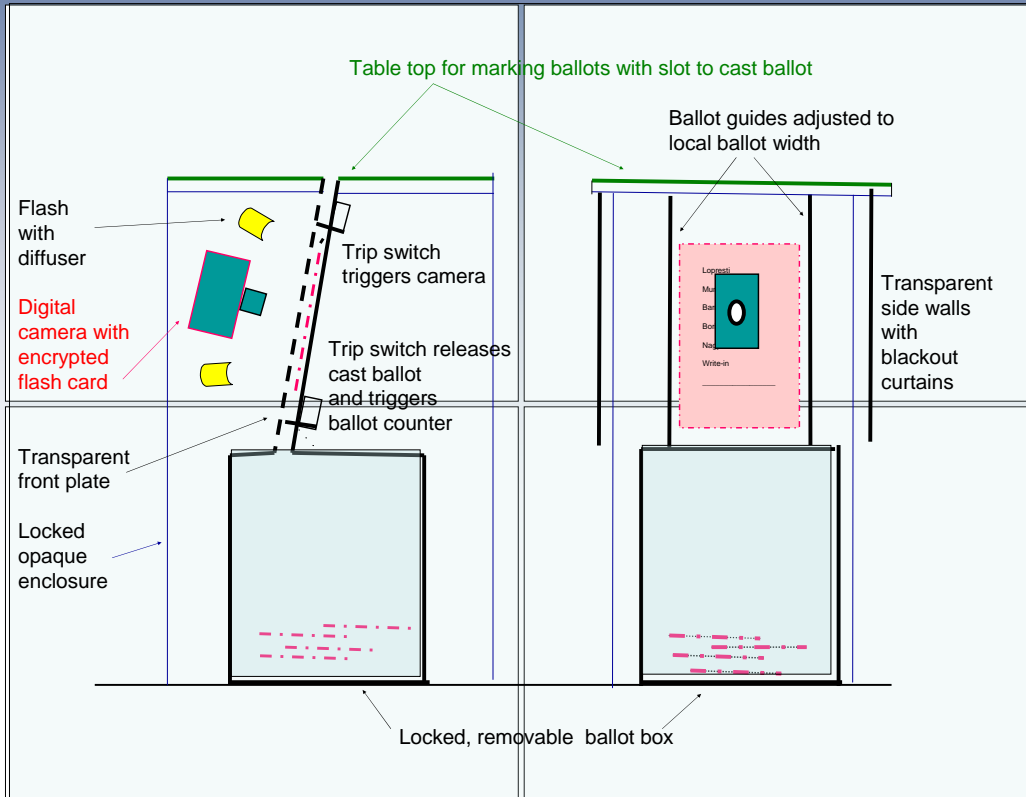


Lightweight, inexpensive, jam-proof, battery-operable ballot reader

George Nagy

Electrical, Computer, and Systems Engineering



DESIGN

- Interlocked opto-sensors and trippers on linear ballot path
- Entire mechanism visible to voter when side curtains are raised
- Gravity feed from insertion of ballot in slot to ballot box
- Over 200 ballots can be processed on four D batteries
- Local or central mark count from 300 dpi ballot images
- Wide range of ballot formats
- Optional display of cast vote based on interpreted ballot image (ballot perforated to annul it)
- Optional duplex imaging with second camera
- Paper ballot is actually “cast” by voter

Mark Characterization

Identified locations of voting ovals

Identified locations of voting marks

- Ballot mark characterization for consistent op-scan specification, testing, and certification.

Related project goals:

1. Large test database of real and synthetic ballot marks and marked ballots to facilitate DIA research community involvement.
2. Accurate ballot mark characterization for consistent op-scan specification, testing, and certification based on *voter's intention*.
3. Bias-free methods for automated and human audit and recount of op-scan ballots.
4. Factors that affect voter confidence in election systems.

Whole Ballot Recognition

Stray mark?

Valid vote?

- Voter intent is better modeled by evaluating all marks on same ballot together (context-sensitivity).

“Blind” Auditing

shuffle

redact

- Bias-free method for semi-automating hand recounts of op-scan ballots.

Collaborative Research: CT-T:

Following the Paper Trail: Reliable Processing of Voting Records for Trustworthy Elections

NSF CNS 0716368, 0716393, 716647, 0716647
(Dr. Karl Levitt, Program Officer, Cyber Trust)

Dan Lopresti and Ziad Munson, **Lehigh University**
George Nagy and Anne Miller, **RPI**,
Elisa Barney Smith, **Boise State University**
Chris Borick, **Institute of Public Opinion**
Muhlenberg College

Homogeneous Class Display

Classified as votes

Classified as non-votes

- Marks grouped as “vote” or “non-vote” based on software classification.
- Makes it easier to identify anomalous results by quick inspection.