NIST National Institute of Standards and Technology U.S. Department of Commerce

EAC Accessibility Grants: Leveraging Cutting Edge R&D in Next Generation Standards

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U.S. Election Assistance Commission

Accessible Voting Technology Initiative

- In 2009 & 2010, Congress appropriated $8M to the EAC to improve voting accessibility for all citizens
  - Created a 3-year R&D competitive grant competition
- 2010 EAC AVTI grant program
  - 2010 – Military Heroes Initiative
  - 2011 – Intermediary Grants
    - Information Technology and Innovation Foundation (ITIF)
      - Two rounds of sub-grants
    - Research Alliance for Accessible Voting (RAAV)
      - Clemson University and their coalition partners

AVTI Research

- Focus
  - Current state of elections: voter surveys & information gathering
  - Voting technology design & prototyping
  - Best practices, guidelines, & recommendations
- Impact on Voters
  - Less than half of the 35 million eligible voters with disabilities voted in 2012 due to physical, intellectual, educational, and political barriers in elections
  - R&D benefits voters with communicative, physical, and cognitive disabilities
- Major Funded Projects
  - Military Heroes Initiative
  - Prime III
  - Anywhere Ballot

EAC AVTI Funded R&D

- Apps4Android
- Association of Assistive Technology Act Programs (ATAP)
- Carnegie Mellon University, Silicon Valley (CMU-SV)
- Center for Information Technology Research in the Interest of Society (CITRIS)
- Clemson University
- Election Center
- Election Data Services
- Georgia Tech Research Institute (GTRI)
- GT Center for Assistive Technology and Environmental Access (CATEA)
- Michigan State University
- OpenIDEO Innovation Challenge
- Operation BRAVO Foundation
- Paraquad, Inc.
- Rutgers University
- Tennessee Disability Coalition
- UC, Berkeley Election Administration Research Center (EARC)
- University of Baltimore
- University of Colorado Denver Assistive Technology Partners (ATP)
- University of Maryland, Baltimore County (UMBC)
- University of Utah
- University of Washington Center for Technology and Disability Studies (UWCTDS)

http://www.eac.gov/payments_and_grants/2009_accessible_voting_technology_initiative.aspx

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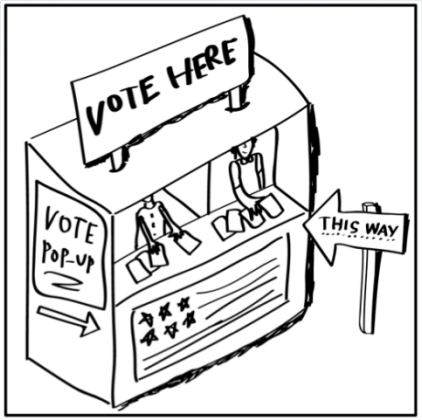
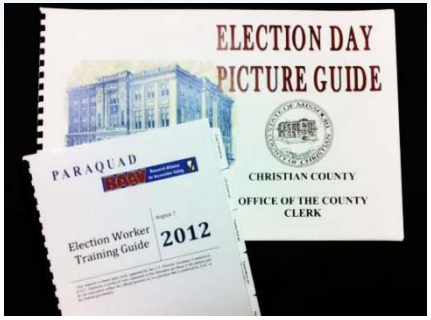
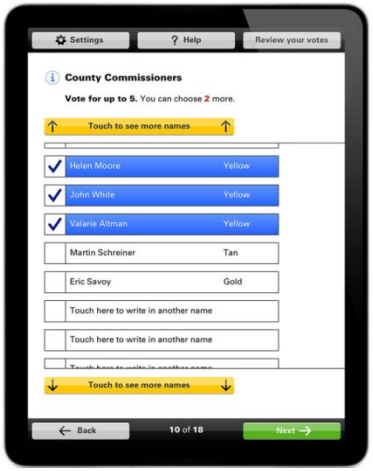
Over 45 R&D Innovations & Solutions







State of Accessibility in Elections

Voter Participation

- 15.6 million people with disabilities reported voting in the November 2012 elections
  - 5.7% less than turnout for voters without disabilities
- 2.3% fewer people with disabilities registered to vote than people without disabilities
- Notable barriers to participation
  - Insufficient accessibility in voting booths and voting system design
  - Complex instructions and poor ballot design

Sources
Utah & CalTech: http://elections.itif.org/reports/AVTI-001-Hall-Alvarez-2012.pdf
CATEA: http://elections.itif.org/reports/AVTI-005-Sanford-2013.pdf
UMBC: http://elections.itif.org/wp-content/uploads/AVTI-006-Kane-2013.pdf

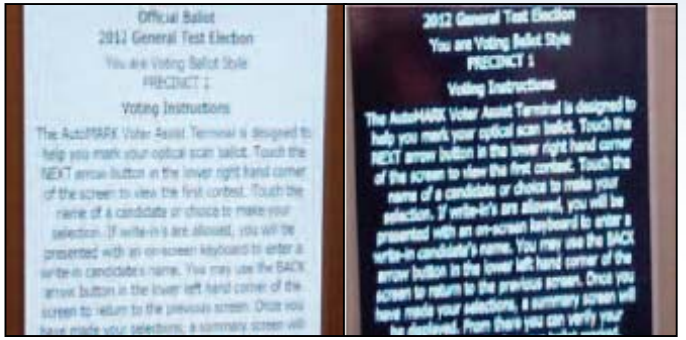
Voter Experiences

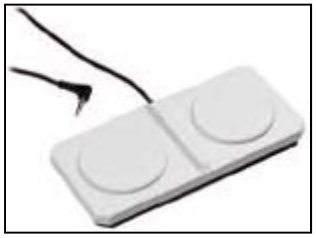
- 2012 Election Survey
  - More than 30% of voters with disabilities had difficulty voting at the polling place
    - Vs. 8% for voters without disabilities
  - 30% of voters with disabilities needed assistance in the polling place
    - Vs. 11% for voters without disabilities
  - 58% of voters with disabilities would still prefer to vote at polling place
    - 25% would prefer vote-by-mail vs. 14% voters without disabilities

Sources
Rutgers: http://smlr.rutgers.edu/disability-and-voting-survey-report-2012-elections

Technology Review

- Common accessible voting system features
  - Enhanced visual display
    - e.g. large font option, color contrast option
  - Speech output
    - e.g. read words displayed on screen, speech tempo option, volume adjustments
  - Tactile keypad input
    - Alternative to touchscreen input
  - Switch input (dual)
    - e.g. sip and puff, rocker





Sources

ATAP: http://www.ataporg.org/docs/RAAV%206.27.13%20publish.pdf

TRACE: http://trace.wisc.edu/ez/

Military Heroes Project

Military Heroes Project

- Research voting technology and processes for military service members who sustained disabling injuries in combat
  - Multiple and overlapping physical, emotional, and social issues
- Determined challenges for recently injured military personnel
- Developed recommendations for election administrators and election system designers

Source
ITIF, GTRI, & the Operation BRAVO Foundation
http://elections.itif.org/resources/resources-voting-for-veterans-with-disabilities/

Military Heroes Project

- Recommendations for election administrators
  - Accessible absentee VS in rehabilitation facilities
  - Communication and coordination between the VA medical facilities and local election officials
  - Make accessible voting information available
  - Streamline the process for obtaining absentee ballots
  - Relax local ballot design requirements
  - Make ballot data available in electronic format
  - Pursue innovative technology

Source
GTRI: http://elections.itif.org/resources/resources-voting-for-veterans-with-disabilities/

Military Heroes Project

- Guidance for election system designers
  - Systems must be flexible, portable, and have options for various personal assistive technology (PAT)
  - Technology recommendations
    - Improve ballot interfaces
    - Screen magnifiers
    - Adjustable contrast and brightness
    - Speech output
    - Speech recognition
    - Touchscreens
    - Mobile devices
    - Eye or head tracking technology

Source
GTRI: http://elections.itif.org/resources/resources-voting-for-veterans-with-disabilities/

Voting Technology

Interaction Design: iPad Use

- Using iPads in minimum care residence facilities
  - 34% of participants had significant problems using the touchscreen
  - More than half of participants were unable to display number keys
  - Recommendations
    - Use a stylus
    - Use stand with appropriate angle
    - Provide clear instructions on gesture interaction

Source
ATP: http://elections.itif.org/reports/AVTI-008-McGrew-2013.pdf

Interaction Design: Enhanced iPad

Source
GTRI: http://elections.itif.org/wp-content/uploads/AVTI-018-GTRI-Case-2013.pdf

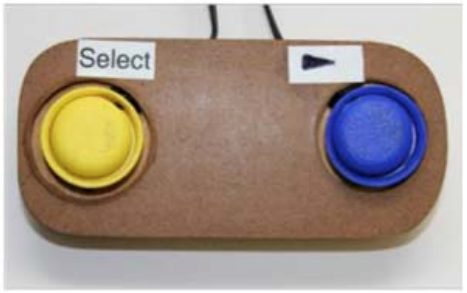
Interaction Design: Joystick Input

- Smart voting joystick
  - Dual-axis joystick with auditory and haptic feedback
  - Designed for voters with motor & dexterity impairments

Source
MSU: http://elections.itif.org/wp-content/uploads/AVTI-009-MSU-Joystick-2013.pdf

Interaction Design: Tactile Input

- Designed for Older Adult Voters with Arthritis
- 2-button (advance forward and select)
- 3-button (with backward)
- 5-button (with next and previous contest)



Source
GTRI: http://elections.itif.org/wp-content/uploads/AVTI-011-GTRI-UserInputDevices-2013.pdf

Research Prototypes: Prime III

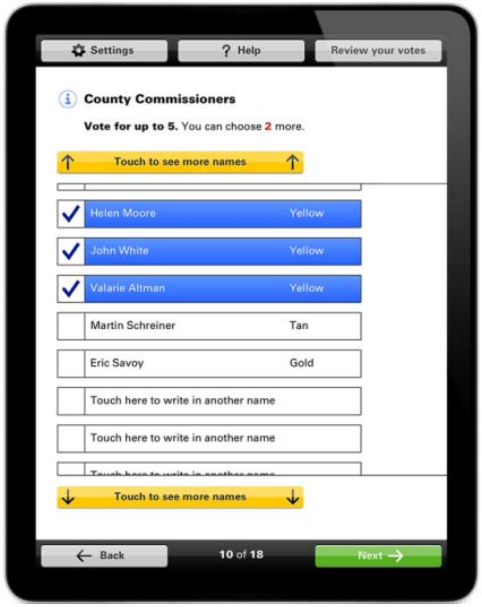
- Universally designed, private, secure, multimodal voting system
- Demo: https://hxr.cise.ufl.edu/PrimeIII/
  - Access code: 0000
- 2013 Prime III & Balloting Demo
  - http://youtu.be/bM5DKP4c4aw
- 2014 Demo with intelligent OCR and automatic paper handling
  - http://youtu.be/YPorhOMzaKk

Prime III
One Machine, One Vote for Everyone

Source
http://primevotingsystem.org/

Research Prototypes: Anywhere Ballot

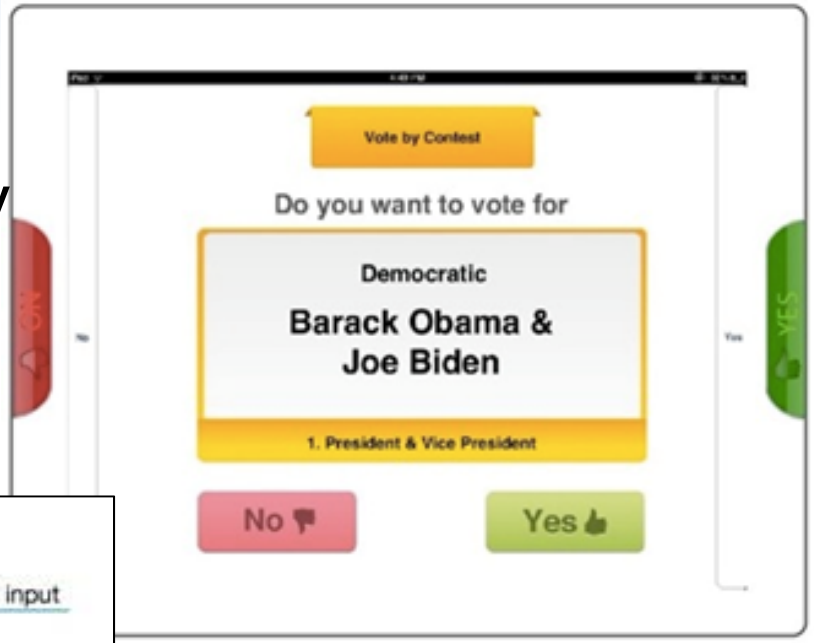
- Online ballot marking prototype
- Plain Language and Plain Interaction
  - Designed for voters with low literacy skills or mild, age-related cognitive impairment
- Demo: http://anywhereballot.com/
- Design principles: http://civicdesign.org/projects/anywhere-ballot/

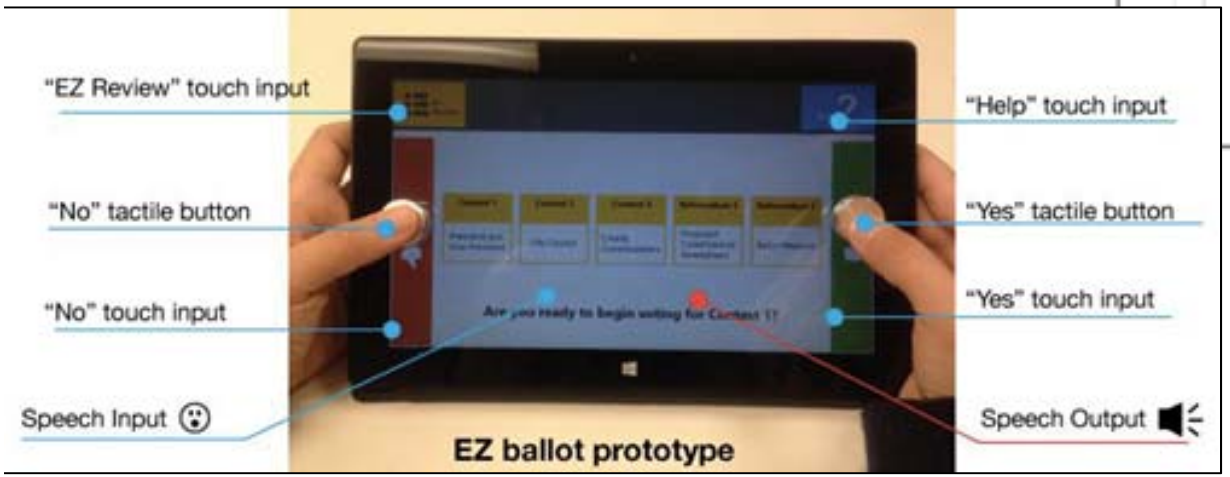


Source
http://elections.itif.org/reports/AVTI-007-Chisnell-Davies-Summers-2013.pdf

Research Prototypes: EZ Ballot

- Designed for voters with cognitive, visual, and dexterity limitations





Source
CATEA: http://elections.itif.org/wp-content/uploads/EZ-Ballot_ASSETS-final.pdf

R&D in Elections: Bridging the Gap

- The gap
  - Performing cutting edge elections research
    - Academic Institutions
    - Civil Organizations
    - Independent Researchers
  - Developing and managing elections systems
    - Vendors
    - Election Officials
- The bridge
  - Continue piloting new technology in state & local elections
  - Integrate new technology & design into elections systems development processes
  - Employ use of usability & accessibility interface and interaction best practices in election system design
  - Usability & accessibility roadmap for next generation standards

Questions?

Accessible Voting Technology Portal

nist.gov/itl/vote/accessiblevoting

Prior to Voting

- Voter Information Guides
  - Researched designing guides for voters with aphasia, traumatic brain injury, and Alzheimer's
- Design strategies for written and electronic content
  - Present content in text, images, and speech
  - Simplify, highlight, and isolate key points
  - Divide dense text into short, readable paragraphs
  - Rephrase content for maximum comprehension
  - Provide accurate sample ballots

Sources

UMBC: http://elections.itif.org/wp-content/uploads/AVTI-006-Kane-2013.pdf

CITRIS: http://elections.itif.org/wp-content/uploads/AVTI-019-CITRIS-VoteYourMind-20131.pdf

Prior to Voting

- Poll worker training
  - Why?
    - Poll workers do not know of available accommodations
    - Poll workers are not familiar with accessible voting equipment
  - Current training is 1-2 hours of PowerPoint lectures
    - Hands-on training is difficult to implement for election officials
- Training methods
  - Codesigned training materials and best practices
    - Election Day Picture Guide
  - National online training course
    - http://www.accessiblevoting.gatech.edu/

Sources
Paraquad & TDC: http://www.nist.gov/itl/vote/accessiblevoting/
CATEA: http://elections.itif.org/wp-content/uploads/AVTI-021-Harris-2014.pdf

Prior to Voting

- Voter outreach
  - Long term care facilities
    - Teams of Election Officials visit residents
    - Pilot studies resulted in recommendations for Election Officials
  - Voting system demonstrations
    - Via state AT programs
    - 54% of participants have experience with AT
      - Less than 10% have experience with AT used in voting
    - Demos improved voter comfort with accessible voting systems

Sources
EARC: http://elections.itif.org/wp-content/uploads/AVTI-010-EARC-2013.pdf
ATAP: http://www.ataporg.org/voting.html