



# Scantegrity II Mock Election at Takoma Park



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and Scantegrity Team (GWU, MIT, Ottawa, UMBC, VSI, Waterloo)  
[www.scantegrity.org](http://www.scantegrity.org)

NIST E2E Voting Systems Workshop  
October 13, 2009



## Main Results

- Overall Scantegrity worked well: voters found it reasonably easy to use and accepted it
- Voters had strong confidence in Scantegrity
- 31% of voters verified their votes on-line



## Scantegrity Mock1 Team



## Scantegrity Mock1 Team

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**University of Ottawa**  
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**University of Waterloo**  
Jeremy Clark

**Voting Systems Institute (VSI)**  
David Chaum

## ● ● ● | Outline



- Research Goals
- Mock1 Voter Experience
- Assessment Methods
- Findings
- Recommendations

## ● ● ● | Mock1 Research Questions

*How well will Scantegrity work in practice?*

- How easy is it for voters to use Scantegrity?
- How many voters will verify their votes on-line?
- How well will voters and election officials accept Scantegrity?



## Research Plan

- Mock1 – April 11, 2009
  - Capabilities demonstration
- Binding municipal election – Nov. 3, 2009
  - Focus on election officials
- Mock2 – April 2010
  - Comparative field test and expert review  
(not constrained by binding election)



## Mock1

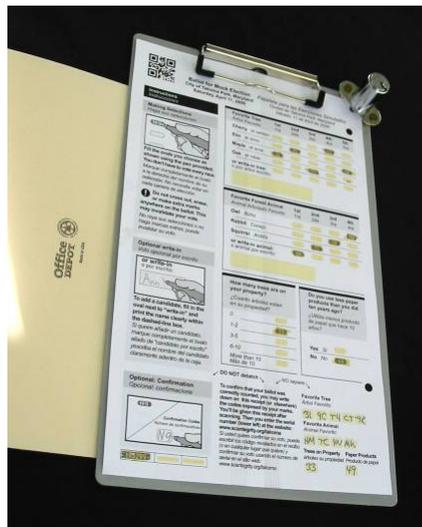
- April 11, 2009
- Community Center, Takoma Park, MD
- 95 voters (anyone could vote)
- 7 Takoma Park poll workers
- 4 ballot questions about trees
- advertised via newsletter, email, web
- Additional data collected at MD Day at UMCP (April 25, 2009)



## Voter Experience



## Locked Clipboard with Privacy Sleeve



Prevents chain voting



# Ballot

**Ballot for Mock Election** City of Takoma Park, Maryland Saturday, April 11, 2009

**Papeleta para las Elecciones Simuladas** Ciudad de Takoma Park, Maryland Sábado, 11 de Abril de 2009

**Instructions / Instrucciones**  
**Making Selections / Haga sus selecciones**  
 Fill in the oval to the right of the name of your choice. You don't have to vote every race. Marque completamente el óvalo a la derecha del nombre de su selección. No necesita votar en cada carrera de elección.  
 Do not cross out selections or make extra marks on the ballot. Extra marks on your ballot may invalidate your vote. No raye sus selecciones o no haga marcas extras; puede invalidar su voto.  
**Optional write-in / Más opciones por escrito**  
 or write-in / o por escrito:  
 To add a candidate, fill in the oval next to "write-in" and print the name clearly within the dotted line box. Si quiere añadir un candidato, marque completamente el óvalo al lado de "candidato por escrito" y escriba el nombre del candidato claramente dentro de la caja.  
**Confirmation Codes / Números de confirmación**  
 To confirm your ballot was correctly counted, you may write down the codes exposed by your marks on the receipt portion of the ballot (or elsewhere) and check your ballot using the serial number at: [www.sceategrity.org/takoma](http://www.sceategrity.org/takoma). Si usted quiere confirmar su voto, puede escribir los códigos revelados en el medio de su candidato (o en otro lugar) y confirmar su voto usando el número de serie en el sitio web: [www.sceategrity.org/takoma](http://www.sceategrity.org/takoma).

**Favorite Tree / Árbol Favorito**

	1st	2nd	3rd	4th	5th
Cherry / el cerezo	<input type="checkbox"/>				
Elm / el álamo	<input type="checkbox"/>				
Maple / el arce	<input type="checkbox"/>				
Oak / el roble	<input type="checkbox"/>				

or write-in tree / o por escrito árbol:

**Favorite Forest Animal / Animal del Bosque Favorito**

	1st	2nd	3rd	4th
Owl / búho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rabbit / conejo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Squirrel / ardilla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

or write-in animal / o animal por escrito:

**How many trees are on your property? / ¿Cuántos árboles están en su propiedad?**

0	<input type="checkbox"/>
1-2	<input type="checkbox"/>
3-5	<input type="checkbox"/>
6-10	<input type="checkbox"/>
More than 10 / Más de 10	<input type="checkbox"/>

**Do you use less paper products than you did ten years ago? / ¿Utiliza menos productos de papel que hace 10 años?**

Yes / Sí

No / No

**Favorite Tree / Árbol Favorito**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

**Favorite Animal / Animal Favorito**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

**Trees on Property / Árboles en Propiedad**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

**Paper Products / Productos de papel**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>



# Ballot Marking





## Invisible Codenumbers

031337
<i>President:</i>
 Alice
 Bob
 Carol
031337



## Revealed Codenumber

031337
<i>President:</i>
 Alice
 Bob
 Carol
031337



## Detachable Chit

031337

*President:*

Alice

Bob

Carol

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*vx* 031337



## Detachable Chit

031337

*President:*

Alice

Bob

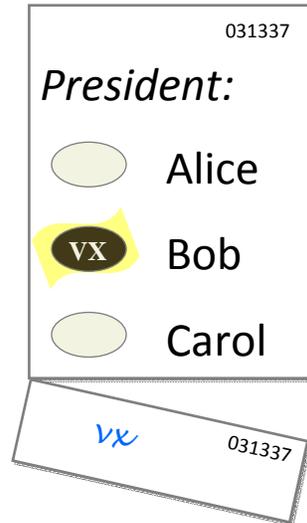
Carol

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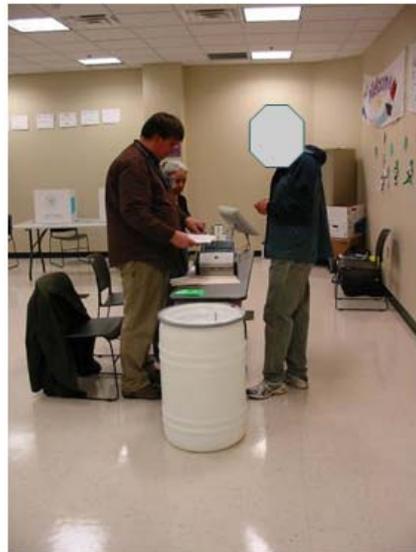
*vx* 031337



## Detachable Chit



## Scanning Station

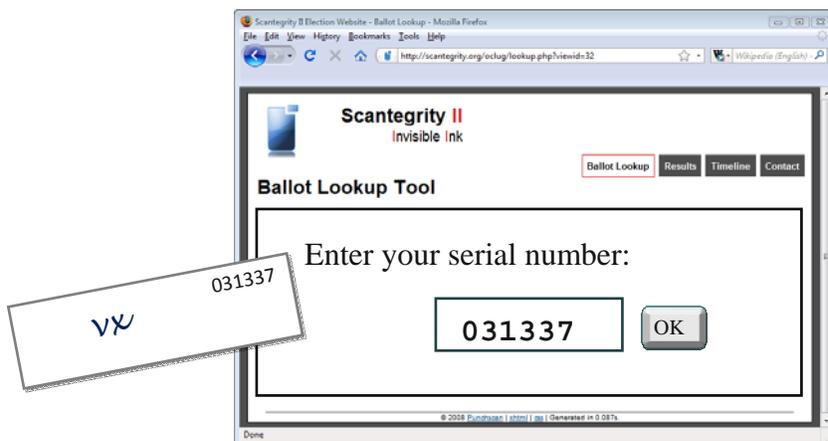




## Scanning Station

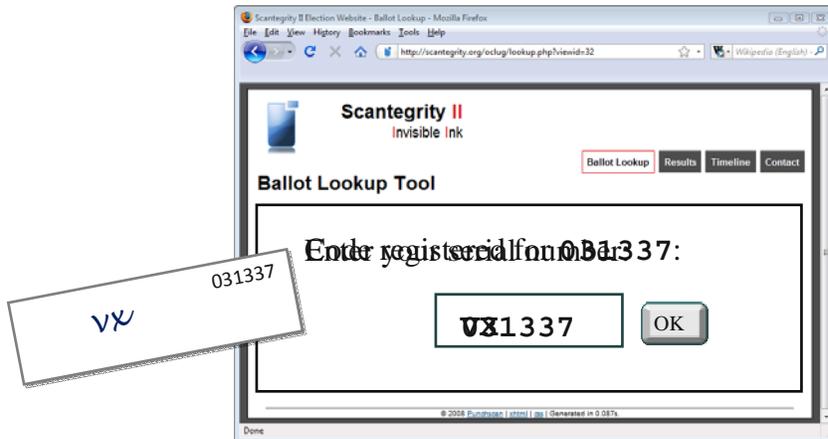


## On-Line Verification (after voting)





## On-Line Verification (after voting)



## Assessment Methods

- Questionnaires for voters and poll workers
- Focus groups for voters and poll workers
- 2 unobtrusive observers in polling room
- On-line questionnaire for voters who verified

(methods approved by UMBC Inst. Review Board)



## Surveys



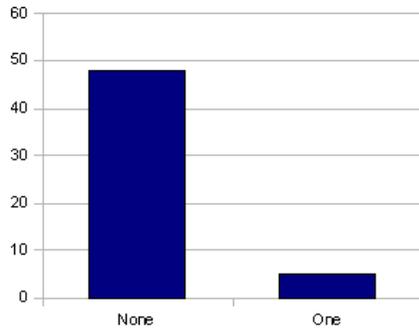
## Voter Demographics

- 80 voters filled out questionnaires
- Highly educated
- High family income
- Frequent computer users
- Mostly 50-64 years old
- Able to get to election on their own  
(not representative, but provided useful feedback)

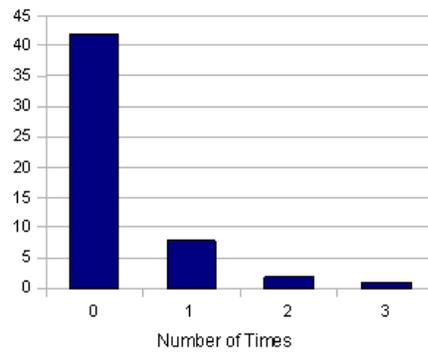


## Selected Results (observers)

Ballots Spoiled By Voter

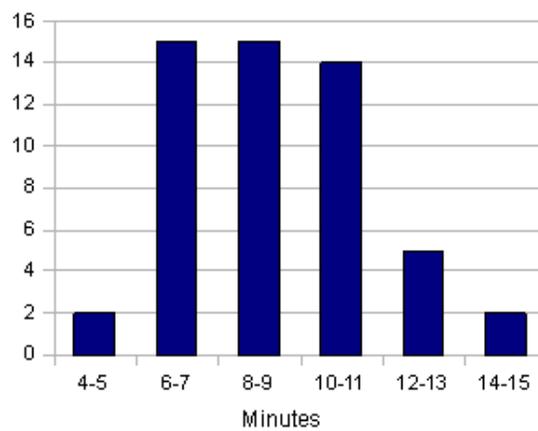


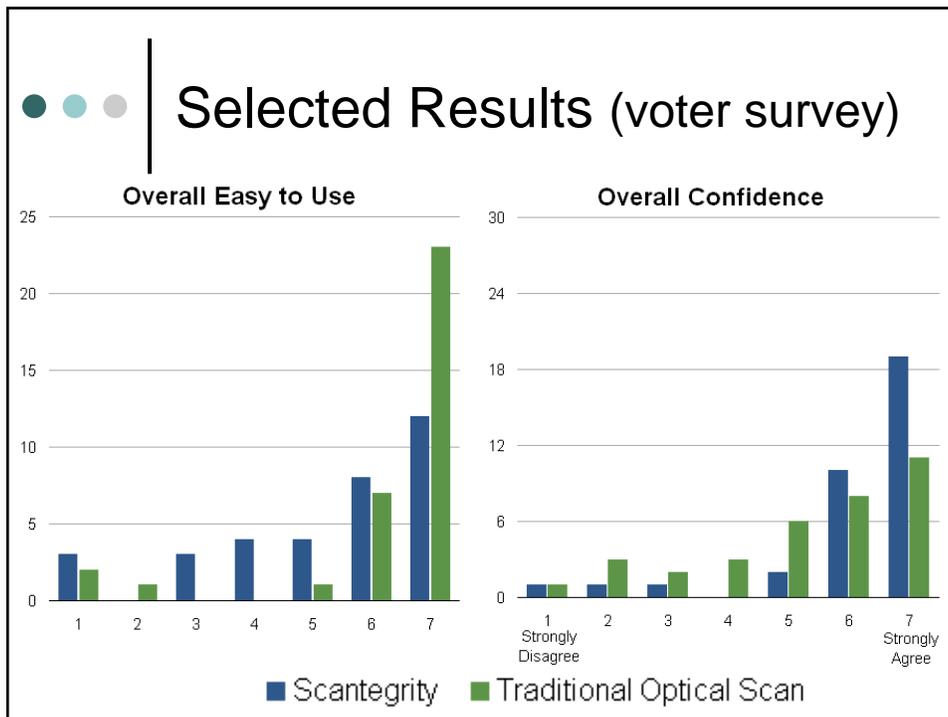
Voters Asked For Assistance



## Selected Results (observers)

Time to Vote





- ## Findings
1. Overall Scantegrity worked well and was well accepted
  2. Voting **process** took too much time, especially at scanner
  3. Providing instructions in one chunk was overwhelming, and **instructions** were too complex
  4. **Locked clipboard** added complexity but little security
  5. Poll workers felt that process could be sped up



## Findings (continued)

### *Process:*

6. Some wondered if others will have difficulty writing down codenumbers and verifying
7. Poll workers disliked that Scantegrity team member handled ballots at scanner
8. Poll workers felt they should have been more in charge

### *Technology:*

9. Poll workers liked visual feedback that ballot was scanned
10. Scanner was finicky
11. Special pens should be in voting area only



## Recommendations

1. Eliminate locked clipboard
2. Eliminate redundant instructions
3. Print codenumbers with reduced char. set
4. Use chisel-style pen
5. Have multiple scanners
6. Consider adding printer



## New Scanner Feeder



## Conclusions

- Preliminary evidence that Scantegrity can be effectively used and will likely be well accepted by voters
- Flow of people through voting process must be improved
- 31% of voters verified their votes on-line
- Binding municipal election Nov. 3



## Acknowledgments

*Supported in part by:*

DoD IASP (Alan Sherman)

NSF CNS (Poorvi Vora)



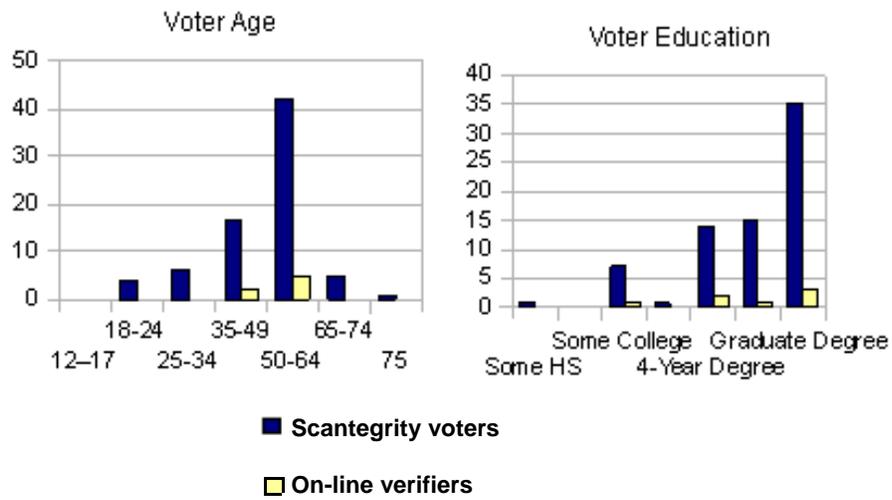
## Extra Slides



## Maryland Day at UMCP (4-29-09)

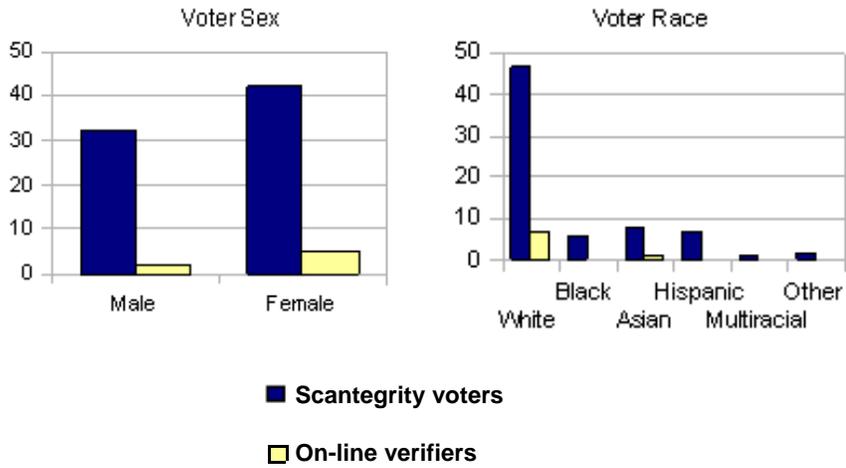


## Demographics

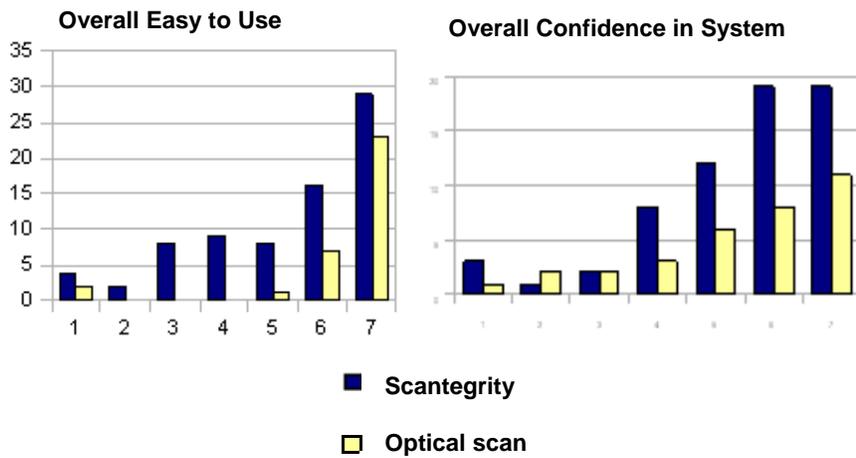




## Demographics



## Selected Results (voter survey)





## Takoma Park Community Center



## Unobtrusive Observers

