



# Electronically Accessible Voting Systems



Group Members: Drew Bozarth, Tyler Kay, Everett Prussak, Max Starreveld, Rahul Sura

## Abstract

- Voting in the US has been a contentious problem for decades
- In recent elections, voters have raised concerns about the fairness in our current voting system
- Our group wanted to approach this by making it easier for minority groups, people with accessibility constraints, and those in gentrified areas to vote in order to achieve an equal and fair democratic process
- Using HTML, PHP, and SQL, we built the foundation for a system that is accessible to all voters who previously faced hardships when voting
- It wouldn't be easy to make a fully functioning secure e-voting system in the course of just 3 semesters, so we dialed our focus towards creating the accessibility aspects to serve as a proof of concept
- Our goal is to help people with disabilities that hinder their ability to vote whether it is caused by physical or geographical interference. Additionally, our solution allows overseas military members an alternative way to vote since the current form of requesting and mailing paper ballots is flawed

## Introduction

TABLE 1. POLLING PLACE DIFFICULTIES REPORTED BY VOTERS IN THE 2012 ELECTIONS

	Disability	No disability
1. Finding or getting to polling place	6%	2%
2. Getting inside polling place (e.g., steps)	4%	0%
3. Waiting in line	8%	4%
4. Reading or seeing ballot	12%	1%
5. Understanding how to vote or use voting equipment	10%	1%
6. Communicating with election officials	2%	1%
7. Writing on the ballot	5%	0%
8. Operating the voting machine	1%	1%
9. Other type of difficulty	4%	1%
Any of above	30%	8%

Figure 1: Table that took a survey on Common Current Day Voting problems for Voters with Disabilities versus No-Disabilities<sup>1</sup>

- Accessible Voting System for citizens with disabilities is not currently instated and causes a major decrease in the number of votes
- Voters with disabilities will choose rather to not vote because they often times have problems understanding how to vote, reading the ballots or submitting the ballots
- Accessible E-Voting would provide an additional form of voting to create more convenience for the voter which increases the overall number of votes in an election
- Online Voting Systems have been implemented in multiple oversea countries (India, Estonia) and proved to be beneficial for both the citizens and the election<sup>3</sup>
- Creates a stress-free environment for the voter, who will cast their vote from the comfort of their own time and location
- Could allow the government to count each vote with code rather than counting each vote by hand, which increases vote results
- Increases the Accepted Number of Identifications for the voters, which will increase the voter turnout
- Allows citizens to feel more comfortable about their vote not being destroyed in the mail or the voting machine malfunctioning

**Acknowledgements:**

1. Dr. Kelsey Gray (Professor)
2. Dr. Bingjie Zhang (Professor)
3. Matt Bernard, Research Engineer at VotingWorks

**References:**

1. Schur, Lisa, et al. "Accessible Democracy: Reducing Voting Obstacles for People with Disabilities." Election Law Journal: Rules, Politics, and Policy, vol. 14, no. 1, 2015, pp. 60–65., <https://doi.org/10.1089/eij.2014.0269>.
2. Jafar, Uzma, et al. "Blockchain for Electronic Voting System-Review and Open Research Challenges." Sensors (Basel, Switzerland), MDPI, 31 Aug. 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8434614/>.
3. Kaliyamurthi KP, Udayakumar R, Parameswari D, Mugunthan SN. 2013. Mugunthan, "highly secured online voting system over network. In: 4833 Indian Journal Science and Technology Print ISSN: 0974-6846 Online ISSN: 09745645 Vol 6

## System Design using HTML, SQL, PHP

Figure 2: Login Page that was created with PHP and HTML

Figure 3: Image from gci-voting.com and the HTML code to product

```
<div class="form-group col-md-6">
  <label for="pass">Password</label>
  <input type="password" class="form-control" id="pass">
</div>
<div class="form-group col-md-6">
  <label for="social">Social Security Nu
  <input type="password" class="form-control" id="social">
</div>
```

Figure 4: Screenshot of the HTML code for Signup page

- After our HTML was up and running, we had to understand SQL and PHP to allow connection from HTML to our phpMyAdmin database
- Learning PHP, we connected all of our created UI friendly HTML to a large database to collect Voter usernames, passwords, votes, and more
- Our group created an Electronically Accessible Voting System using multiple programming languages and hosting websites ([gci-voting.com](http://gci-voting.com))
- User Interface makes it easy to vote, so we found that our website must be elegant
- We started with simple HTML code signup page

Figure 5: Voting Screen to Choose Candidates. There is one question per screen for accessibility

Figure 6: ID Image page to allow user to choose any 2 acceptable IDs (more not shown)

id	user_id	user_name	password	date
1	76114394	test	test123	2022-04-16 01:58:23
2	8746336	test1	password	2022-04-17 21:33:52
3	810016	test3	password123!	2022-04-17 22:05:19
4	803726903508732	sample	password	2022-04-17 22:09:20
5	627	everettprussak	th34cjdksl	2022-04-18 19:21:24

Figure 7: PHPmyAdmin Database with sample voter Info

## Results (Research/Implementations)

- We found when multiple people were asked to try our website that they found it very convenient and simple to use
- We found that for people with disabilities that would normally have trouble voting, increasing overall voter convenience makes the election process more fair and equal
- The United States is a large scale election, so we choose to use database and website management tool called "Bluehost" to help maintain security and scalability
- Our current Implementation needs even more security and some hashing algorithms to ensure security for each individual voter and the widespread election

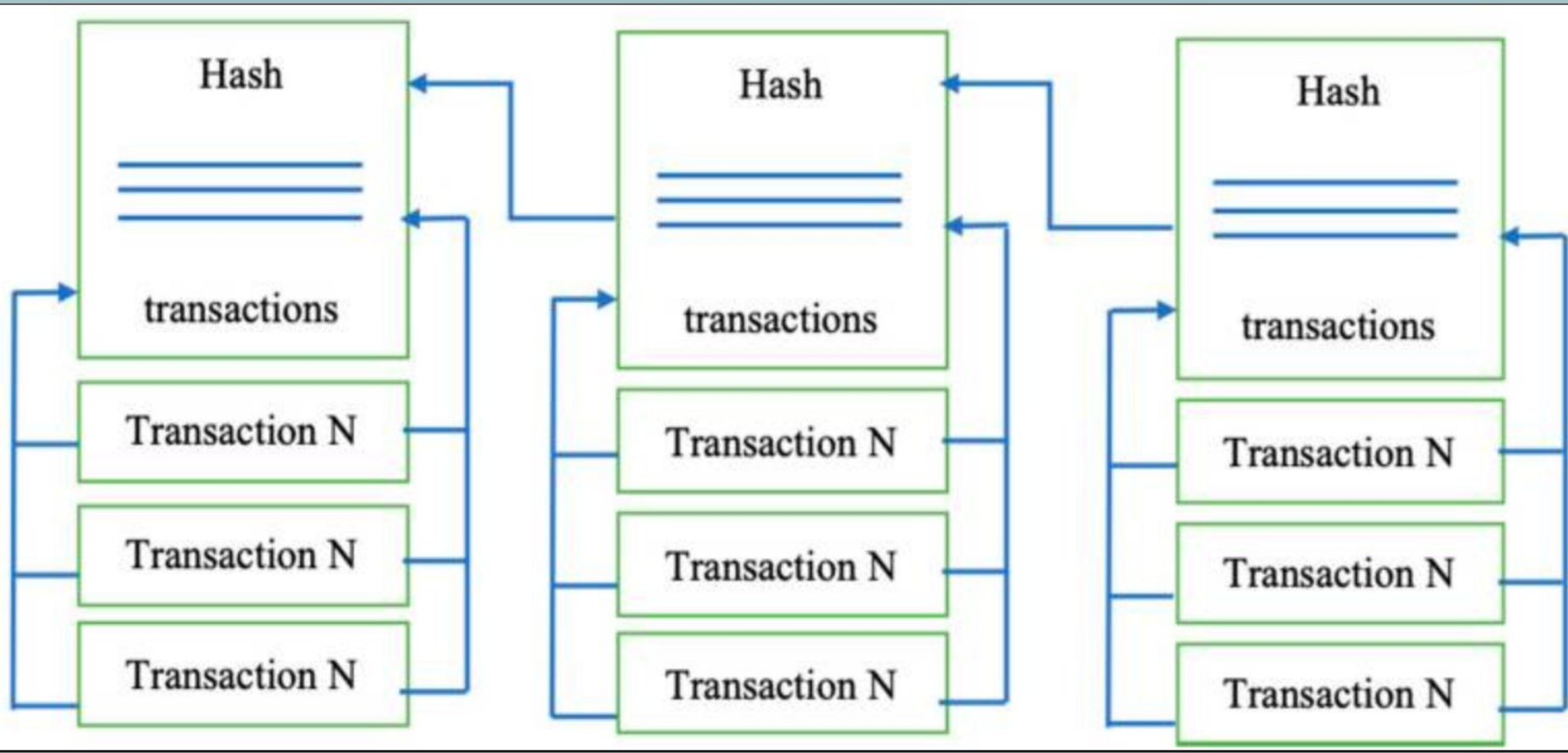


Figure 8: Hashing Algorithm that would increase voter security and integrity of the election<sup>2</sup>

- Overall our results would increase the total voter turnout due to increased convenience and functionality for citizens with disabilities

## Chapman Students Input

- Surveyed 53 Chapman students about their loved ones having difficulty voting

Do you have a close relative in the U.S. and has trouble with voting during the U.S. Elections? 53 Responses

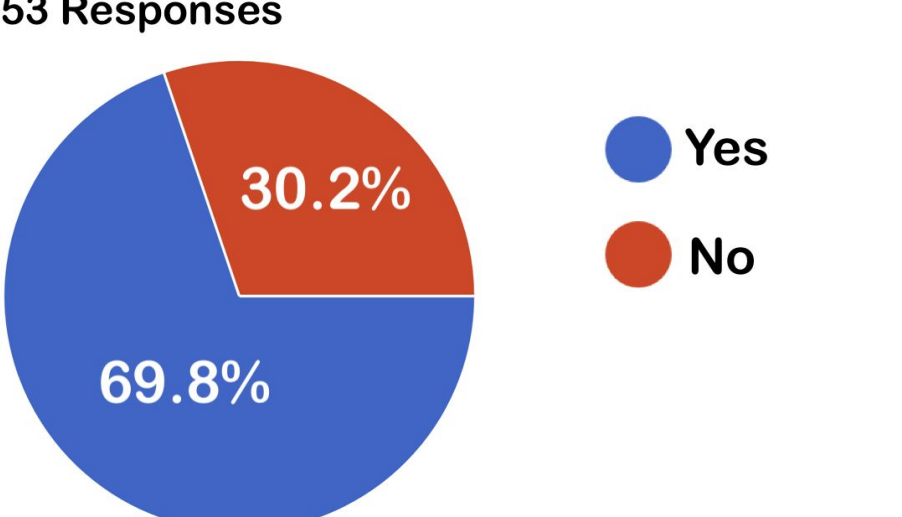


Figure 9: Roughly 70% of surveyed Chapman Students has a loved one who has trouble voting

If you said yes, do you wish they had an easy way to E- Vote? 37 Responses

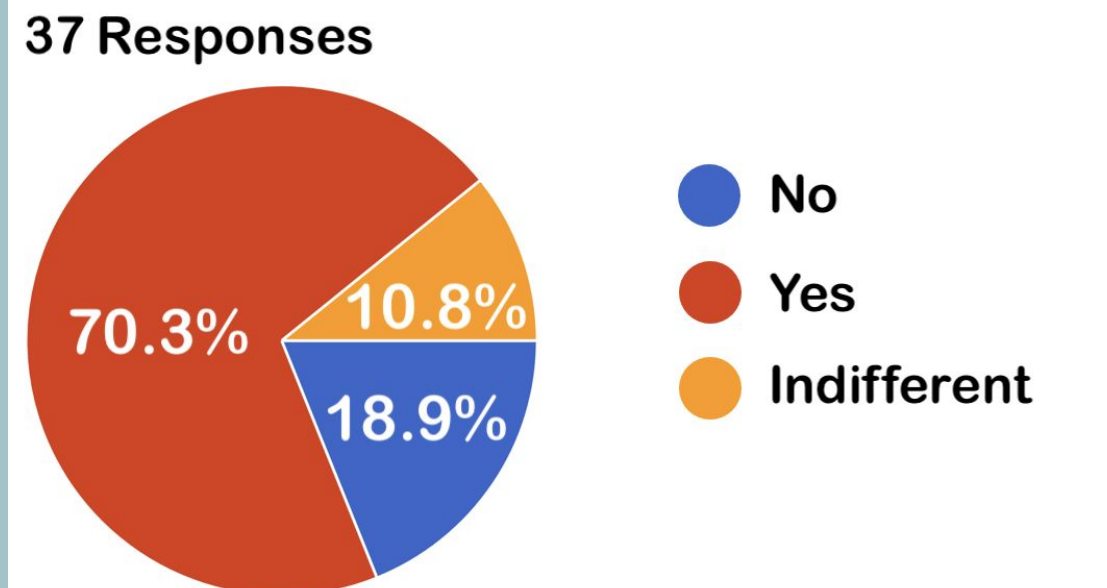


Figure 10: Amongst the people in the survey who answered that they have such relatives, a vast majority wish they could vote without help

If you said yes to the previous question, what was the reason for it being difficult for them? 37 responses

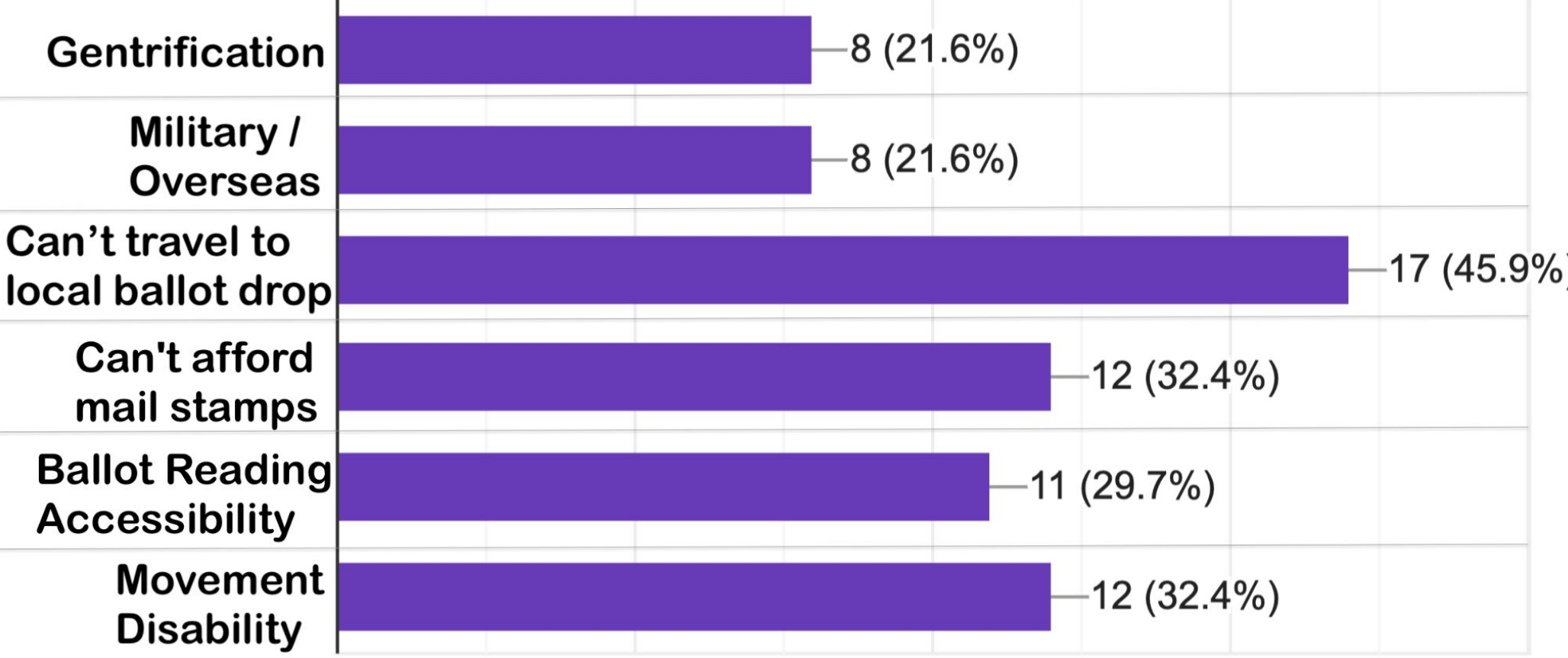


Figure 11: Amongst the people in the survey who answered that they have such relative, responses centered around inability to travel to local ballot drops and other accessibility issues

- It turns out even with a Chapman's higher socioeconomic demographic, there is a large proportion of students who have family that can't easily vote by themselves
- Graphs demonstrate having a tool like our e-voting system would help many families in this country

## Conclusion

- Adding additional forms of voting provides a smoother election process
- This e-voting system provides the necessary accessibility for voters with disabilities
- Our e-voting website would prove to be beneficial if the necessary steps are taken to ensure voter registration information, voting choices, and voting information is private and secure
- This Electronically Accessible Voting System assists citizens with and without disabilities during voting because voters both with and without disabilities might have trouble navigating to polling stations<sup>1</sup>
- Understanding how to vote could create a better environment for more minorities that need additional assistance in the voting process