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Collecting Data for Finding a Mathematical Solution to Gerrymandering

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Mentor: Dr. Petering

Motivation

The motivation for this project is to create a mathematical program that'll create fair, unbiased election maps in order to solve the widespread problem known as gerrymandering. Gerrymandering is when the boundaries of an electoral constituency are modified and manipulated in order to favor a certain party or class, usually the one in power at the time. Gerrymandering is widespread all over the board and creating a program to make unbiased maps would make elections fairer for everyone and ensure balance and representation for everyone.

Objective

My role in the project involved gathering and analyzing a cohesive amount of data for Dr. Petering's program to create the maps. In order to complete this task, I had three objectives in order to provide data specifically tailored to his request.

1. I had found the GIS shapefiles for every state and precinct which is all public data for anyone to utilize.
2. Finding historical voting data for each precinct which is all public data due to federal law was my second piece.
3. The final piece of the puzzle was assigning a major amount of data in the second portion with each individual precinct that merged with the data as it doesn't come attached naturally.

Acknowledgements

▪Election data GitHub project: https://github.com/nvkelso/election-geodata
▪Everyone who peer reviewed the poster
▪My professor, Dr. Petering

Contact info

▪Nathaniel Valentine: valent64@uwm.edu
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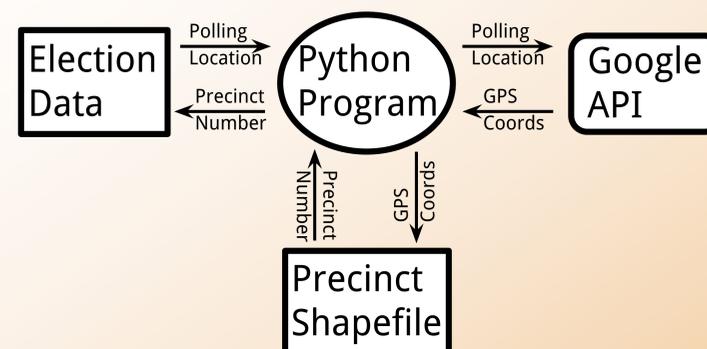## Methodology

Part One: Finding GIS Shapefiles
For every precinct which is public data that included voting locations for the population in the state, this was solved through simple Googling and navigating government webpages thoroughly to find the necessary data for the program

Part Two: Finding Historical Voting Data
The project required historical voting data per precinct, according to federal law public information is readily available. However, the major issue being the data was unnecessarily complicated. Upon looking hard enough all the data could be found.

Part Three: Combining the Two Pieces of Data
Manually sorting the data and properly assigning it was tedious (due to thousands of entries per state if not tens of thousands) but due to prior experiences I suggested using a python program. The program in question assigns every precinct per state with a number. The program takes a row of information, finds the polling location assigned to the data, and through Google Maps API would find the GPS coordinates of the polling location. This then went to the statewide precinct map and found which precinct the GPS coordinates landed in. Finally, it replaced the polling location with the number corresponding to the precinct in order to make it cohesive with my professor's program. However, I didn't need to finish this program fully due to data sorted by others.

```
                    Polling                  Polling
  ┌─────────┐       Location   ╭─────────╮  Location   ┌─────────┐
  │ Election │ ───────────────▶│ Python  │───────────▶ │ Google  │
  │ Data     │ ◀───────────────│ Program │◀─────────── │ API     │
  └─────────┘       Precinct   ╰─────────╯   GPS        └─────────┘
                    Number        │  ▲       Coords
                         Precinct │  │ GPS
                          Number  │  │ Coords
                                  ▼  │
                              ┌──────────┐
                              │ Precinct │
                              │ Shapefile│
                              └──────────┘
```

Conclusion

While looking for more data to plug into the beta version of my program, I found the holy grail of data necessary, a GitHub project by Nathaniel V. Kelso. This included a majority of the shapefiles with election data already attached, essentially making my program unnecessary and my work for this portion of the project finished. The bottom-right portion shows an incomplete but mostly finished map. There's still more work to be done detailed in the last section.

Further work

The only piece of information left in order to make fair maps is the demographics of the precincts, this wasn't included in the scope of the GitHub project I mentioned above. Therefore, I'll be returning next year to present my findings once I have the demographics charted, I'll be able to more accurately explain the process I used to organize the data.
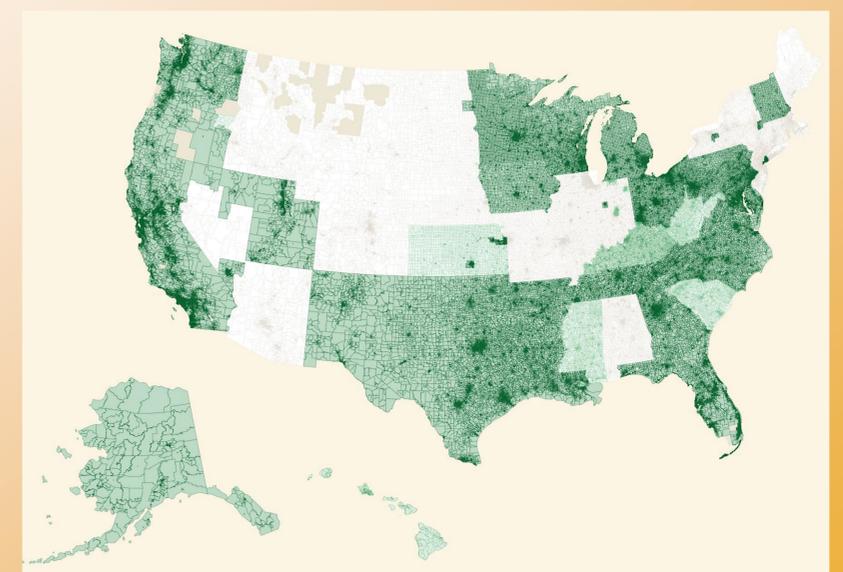
Source: Precinct-level maps from election-geodata compiled by Nathaniel Kelso and Michal Migurski.