Purple America

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Red states, blue states

Goal. Write program to visualize presidential election results.

intended: late CS 1

concepts: data visualization, OOP, map data type

requirements: filled-polygon primitive
Step 0. Collect the data (optional)

**Geometric data.** [www.census.gov/tiger/boundary](http://www.census.gov/tiger/boundary)

- Text files encode geographic information.
- Format useful for programmers.

**Election returns.** [www.uselectionatlas.org](http://www.uselectionatlas.org)

- Web site displays election results.
- Screen scrape to extract raw data.

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Dave Leip’s

Atlas of U.S. Presidential Elections
Step 1. Process the geometric data

State names and boundary points.

% more USA.txt

<table>
<thead>
<tr>
<th>State</th>
<th>Points</th>
<th>Longitude</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>498</td>
<td>-88.200027</td>
<td>34.995548</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-88.202919</td>
<td>35.007942</td>
</tr>
<tr>
<td>Georgia</td>
<td>1363</td>
<td>-84.321953</td>
<td>34.988327</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-84.129639</td>
<td>34.987423</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-84.005501</td>
<td>34.987251</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-84.621552</td>
<td>34.988251</td>
</tr>
</tbody>
</table>
Step 2. Process the election return data

Votes for Romney, Obama, and other, by state.

% more USA2012.txt
Alabama,1255925,795696,22717
Alaska,164676,122640,13179
Arizona,1233654,1025232,47673
Arkansas,647744,394409,27315

: 
Georgia,2078688,1773827,55854

: 
Washington,1290670,1755396,99892
West Virginia,417655,238269,14743
Wisconsin,1407966,1620985,39483
Wyoming,170962,69286,8813

2,078,688 Romney
1,773,827 Obama
55,854 Other
Step 3. Plot the results

Red states, blue states. Pretty picture.

Visualization bug. Misleading and polarizing picture.
Purple America

Key idea. Assign color based on number of votes.
• $a_1 = \text{Romney votes.}$
• $a_2 = \text{Other votes.}$
• $a_3 = \text{Obama votes.}$

$$(R, G, B) = \left( \frac{a_1}{a_1 + a_2 + a_3}, \frac{a_2}{a_1 + a_2 + a_3}, \frac{a_3}{a_1 + a_2 + a_3} \right)$$
More data

Geometric data by county. County names and boundary points.

% more GA.txt

<table>
<thead>
<tr>
<th>County</th>
<th>Points</th>
<th>Longitude 1</th>
<th>Latitude 1</th>
<th>Longitude 2</th>
<th>Latitude 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabun</td>
<td>162</td>
<td>-83.483398</td>
<td>34.993198</td>
<td>-83.108665</td>
<td>35.000683</td>
</tr>
<tr>
<td>Fulton</td>
<td>149</td>
<td>-84.418999</td>
<td>34.073200</td>
<td>-84.418503</td>
<td>34.108799</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-84.414597</td>
<td>34.110100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-84.418404</td>
<td>34.052898</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Election results by county. County names and votes for each candidate.

% more GA2012.txt
Appling, 5233, 1758, 102
Atkinson, 1938, 930, 39
Bacon, 3093, 791, 52
Baker, 785, 794, 12
Baldwin, 7589, 8483, 198
Banks, 5354, 780, 70,
Barrow, 18725, 6028, 517,
Fulton, 137124, 255470, 5752
Wilkinson, 2246, 2181, 29
Worth, 5869, 2487, 80
Election results by county. County names and votes for each candidate.

% more GA1968.txt
Appling,795,760,2678,
Atkinson,288,686,1554,
Bacon,586,279,1935,
Baker,99,548,1067,
Baldwin,2318,2109,2678,
Banks,398,296,1434,
Barrow,1372,1070,2731,
Fulton,64153,77847,36995,
Wilkinson,685,829,1870,
Worth,603,719,3049,

64,153 Nixon
77,847 Humphrey
36,995 Wallace
Purple America: 2012 Presidential Election

over 500,000 pieces of data!
Purple America: 2004 Presidential Election

[Map of the United States showing the results of the 2004 presidential election with states colored in various shades of purple and red, indicating the voting preferences.]
Purple America: 2000 Presidential Election
Purple America: 1992 Presidential Election
Purple America: 1988 Presidential Election
Purple America: 1980 Presidential Election

counties didn't exist in 1980 (oops!)
Purple America: 1964 Presidential Election
Why nifty?

Real data: Motivates and excites students.

Data visualization: Communicates data in clear and engaging manner.

History: Captures changing colors of America.

Open ended...
Opportunities for creativity, enrichment, and inspiration

**Colors.** Explore different color palettes.

**How?** Lookup table.

[Map of the United States with various colors indicating different data points.](http://www.filmschoolrejects.com/features/a-movie-for-a-purple-america-how-lincoln-belongs-to-the-future-lpalm.php)
Opportunities for creativity, enrichment, and inspiration

Map projections. Mercator, azimuthal, Albers, Gall-Peters, ...

How? Spherical geometry.
Opportunities for creativity, enrichment, and inspiration

**Use different data sets.** High-school graduation rates by county. **How?** Screen-scrape (and scrub) data.

[Map image of Georgia showing high-school graduation rates by county.]
Opportunities for creativity, enrichment, and inspiration

Add a GUI. As user hovers over county, display election results.


http://elections.nytimes.com/2012/results/president