Geographic Proportional Representation

David Crowe

1   October, 2016

2   **Abstract**

3   *Geographic Proportional Representation is a new electoral system that preserves the fairness*
4   *benefit of Proportional Representation without the need for a party list and with most*
5   *representatives elected in a geographic area, although this will likely be larger than one*
6   *electoral district. Votes not used at one level are moved up a hierarchy until they elect a*
7   *representative.*

11

12

1 Background

2 The twentieth century was a period of growing dissatisfaction with the traditional *First Past The*
3 *Post* (FPP) electoral system and increasing use of alternative systems such as Proportional
4 Representation (PR) and Single Transferable Vote (STV). One reason FPP is still in use, despite
5 it's unfairness, in some major jurisdictions, including Canada, the United States and the UK, is
6 because every representative is elected by voters within a defined geographic area.

7 Geographic Proportional Representation blends the geographic benefit of FPP with the equal
8 vote benefits of Proportional Representation (PR) guaranteeing that almost all votes contribute to
9 the election of a representative, usually having some connection to where the voters live.

10 Terminology

11 The following terminology is used in this paper:

Candidate	A person on the ballot in a *Basic District*.
Basic District	A geographic region with a single slate of *Candidates* (i.e. optionally one candidate per party, plus independents).
Elector	A person who is eligible to vote.
Independent	A *Candidate* not affiliated with a political party.
Parliament	The institution where all *Representatives* gather to debate and vote.
Representative	A *Candidate* who has been elected to hold a *Seat* for a term.
Seat	A single vote in the *Parliament* on behalf of people in a defined geographic area.
Special District	A *Basic District* that is guaranteed a single *Representative*.
Super District	A collection of *Basic Districts* or smaller *Super Districts*.
Top Level District	A *Super District* composed of all *Basic Districts* – the jurisdiction holding the election.
Vote	For the purposes of calculations a vote is any that is cast even

	if it is partial or spoiled.
Voter	An *Elector* who casts a *Vote* in an election.

1

2 Overview of Geographic PR

3 In a Geographic PR election Electors go to the polls and vote from a list of Candidates just as for
4 FPP. Additionally, they would also vote for a party. Their candidate vote will either help elect a
5 Candidate in their Basic District or their party vote will be combined with votes from related
6 Basic Districts and used to elect a candidate from a Super District. Very few votes would be
7 wasted – not used to elect anyone.

8 The number of votes (not Electors or People) required for one seat for true proportional
9 representation is:

10 $$\text{NVPS} = \text{(Total Votes in All Districts) / (Total Seats in Parliament)} \qquad (1)$$

11 If a Candidate receives at least NVPS votes in the Basic District they are running in they are
12 elected as a Representative. If not, their votes are moved up to the first level Super District based
13 on the associated party votes. This Super District will most likely be composed of two Basic
14 Districts. Surplus votes from a winning candidate are also moved up in proportion to the party
15 votes.

16 The hierarchy of Super Districts should be defined before the election. At the first level this
17 consists of groups of two or more Basic Districts that are most closely related (and possibly some
18 unclustered individual districts) and that are, on average, about double the size of the average
19 Basic District. The second level of Super Districts is a similar clustering from the first level, and
20 so on until the level at which all districts are clustered into one Top Level District representing
21 the entire jurisdiction holding the election. Assuming that the number of Super Districts at each
22 level is no more than half those at the next lower level the number of levels needed is no more
23 than $\log_2$(Number of Districts).

24 For example, a jurisdiction with 512 districts (2^9) would need 9 levels of Super Districts. In the
25 city of Calgary, Alberta, Canada with 14 wards, only four levels would be needed (2^4=16). The
26 province of Alberta, with 87 seats, would require 7 levels (2^7=128) and the country of Canada,
27 with 338 seats, would require 9 levels. The United States House of Representatives would also
28 require 9 levels and the UK House of Commons 10.

1   After the process has occurred at all levels there will be some votes left over (no party or
2   independent will have more than NVPS votes left over). The handful of seats remaining will be
3   awarded to parties or independents in order of the number of votes remaining until all seats are
4   filled.

5   **Detailed Description**

6   *Basic District Elections*

7   Electors vote for both a candidate and for a party. The party vote could be inferred from the
8   candidate vote but this would mean that an elector voting for an Independent would lose their
9   vote should their preferred candidate not win a seat. There may be other cases where an elector
10   prefers a candidate from one party while overall preferring a different party. If an Elector
11   declines to vote for a party, and their preferred candidate does not win, their vote would be
12   discarded.

13   *Clustering of Districts*

14   A unique aspect of Geographic PR is the clustering of Districts into a hierarchy. While essential
15   to the method the precise hierarchy produced is not critically important. What is important is that
16   an Elector knows what will happen to their vote if it is not used to elect a candidate directly in
17   their Basic District, that the candidate they elects retains some connection to their Basic District,
18   and that their vote is not discarded.

19   A hierarchy of districts must be created with the Basic Districts at the bottom, joined into groups
20   of two or three related districts to form the first level of Super Districts, and so on, up to the Top
21   Level District, representing the entire jurisdiction holding the election.

22   In the following simple example there are five districts identified as 'A' through 'F'. At the first
23   level of clustering they are grouped into one Super District containing Basic Districts 'A' and
24   'B' and a second containing 'C', 'D' and 'E'. At the second level of clustering all groups are
25   joined together.
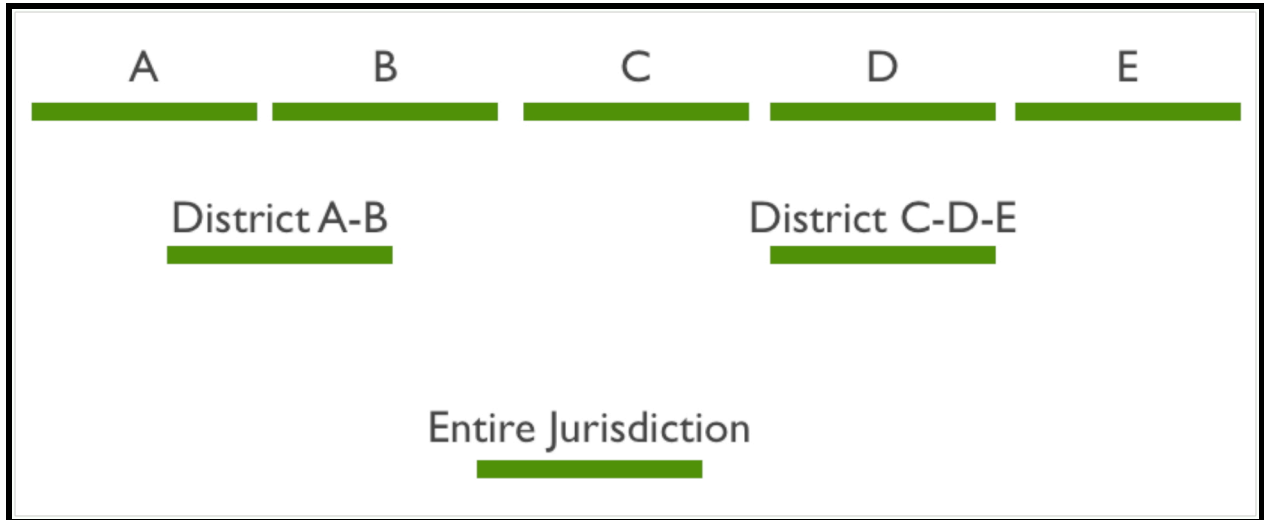
1

2   Clustering could be a manual or automatic process (e.g. using Cluster Analysis). While manual
3   redistricting (changing the boundaries of districts to reflect population changes) is easily and
4   often manipulated, nefarious intent is unlikely to have any significant impact with Geographic
5   PR because the number of votes to elect a Representative is almost constant. Manipulations are
6   only possible within a party, as one Candidate could be favored by manipulating the hierarchy so
7   that their Basic District is joined with those that have weaker Candidates running for the same
8   party. This manipulation would not change the number of Seats won by any party so is of
9   minimal benefit.

10   ***Seats versus Districts***

11   In most FPP electoral systems there is a one-to-one relationship between a district and a seat.
12   Pure PR by contrast has seats without any districts. Geographic PR connects the concept of Seat
13   and District by allowing the awarding of a Seat to a Candidate in either one Basic District or a
14   group of related Basic Districts (a Super District).

15   If it is desired to allow popular Candidates to be elected within a single Basic District there
16   should be more Seats than Basic Districts. For example, if every Basic District had the same
17   population and it was desirable to allow a candidate to be elected with 50% of the vote in a Basic
18   District twice as many Seats as Basic Districts would be required. In reality, assuming that the
19   number of Seats will not be this large, it is possible, although probably not very likely, for a Seat
20   to be awarded based on voting in a single Basic District.

1 ***Rolling Up Votes***

2 Votes that are not used to elect a Representative at level N are moved up to level N+1, associated
3 with the party vote. Votes cannot remain associated with a candidate because there will be
4 multiple candidates for the same party. If a candidate is elected at one level only the surplus
5 votes (more than NVPS) are moved to the next level. If no Candidate is elected at one level all
6 their votes are moved up to the next level. A different situation can arise with Special Districts,
7 which are described later.

8 Votes do not need to be recounted at each level, cumulative totals can be calculated once for
9 each Candidate-Party vote combination and all calculations can be based on these. If a recount is
10 needed, the physical votes in one or more Basic Districts can be recounted and the revised totals
11 used to recalculate the results.

12 ***Rolling Up Candidates***

13 Candidates that are elected at level N are *not* moved up to level N+1 as they have already been
14 elected. All other Candidates are moved up to level N+1 and can be considered for election at
15 this or a higher level.

16 ***Voting Enfranchises Citizens***

17 One effect of Geographic PR is that enfranchisement does not occur with registration to vote but
18 is granted by the act of voting, even if the ballot is spoiled and the vote does not count for a
19 candidate. NVPS is calculated on total votes so if, in one Basic District, nobody voted, there
20 would be no representative elected from that Basic District and the Electors would be
21 represented by Representatives from neighbouring Basic Districts where Electors did vote. If, in
22 another Basic District, only half the Electors vote whereas in yet another every Elector voted, the
23 latter Basic District would have twice the weight when votes rolled up to a Super District and
24 their candidate much more likely to be elected. The net effect of this would be to encourage
25 higher levels of voter turnout. Not voting would be a request to not have a representative in
26 Parliament. There is no unfairness caused by this characteristic because not voting is an
27 individual choice and this vote inequity is solved by every Elector voting – a highly desirable
28 outcome. This characteristic also accommodates enumeration or registration errors.

1 *The Top Level District*

2   The entire jurisdiction holding an election is the Top Level District and is the last point at which
3   votes can be rolled up to elect a candidate. Parties may win seats at this level if they have more
4   than NVPS votes. However, after this last award most parties and all unelected independents will
5   each have less than NVPS votes remaining. Seats left vacant at this point can be awarded to
6   Parties and Independents in diminishing order of leftover vote count.

7 *Choosing a Candidate*

8   When a Seat is awarded to a Party in a Super District based on surplus votes from multiple
9   subsidiary districts there are several ways the Candidate (among all those as yet unelected from
10   the same Party in this Super District) to which the seat should be awarded could be chosen:

11   1. *The Candidate with the most votes in their Basic District.*

12   2. *The Candidate with the greatest percentage of the vote in their Basic District.*

13   3. *The Candidate with the greatest percentage of the population of their Basic District.*

14   The following table is an illustrative comparison of Candidates for the same party in three
15   different Basic Districts being clustered into one Super District. Based on vote totals the
16   Candidate in district A would win. Based on votes received as a percentage of the total votes the
17   candidate in district B would win and based on votes received as a percentage of the total
18   electors the candidate in district C would win.

District	Electors	Turnout	Votes	% of Vote	% of Electors
A	60,000	60%	11,000	31%	18%
B	30,000	70%	7,000	33%	23%
C	35,000	90%	9,000	29%	26%

19 ## Special Issues

20 *Special Districts*

21   For geographically large and sparsely populated Basic Districts it may be desirable to guarantee
22   a Seat even though this may result in a Candidate being elected with less than NVPS votes. In
23   this case a negative number of votes associated with the winning candidate may be moved up to
24   the next level.

1   ***Independents***

2   The likelihood of an Independent winning with Geographic PR if they run in a single district is
3   virtually zero, so they should be allowed to run in multiple districts, even the entire jurisdiction.
4   If they achieve NVPS votes they would be awarded a seat. If voters for an independent can make
5   a separate vote for a party, then any excess votes (all votes if the independent is not elected) can
6   be transferred to parties proportionally.

7   ***Small Parties***

8   FPP is dramatically unfair to parties that are smaller and have support that is evenly distributed
9   across a jurisdiction. A good example is the Green Party that often gets a significant percentage
10   of the vote but usually wins no seats. In the 2008 election in Canada the Green Party received
11   about 7% of the vote without any seats (EC, 2008a). In the UK in 2010 the Green Party won its
12   first ever seat in parliament with 285,616 votes, more votes than received by either Sinn Féin or
13   the Democratic Unionists which won 5 and 8 seats, respectively. Two other parties received even
14   more votes than the Greens (UKIP and BNP) but won no seats (Wikipedia, 2010).

15   FPP encourages parties that have very strong support in some ridings and very little in others –
16   parties that appeal mainly to people in particular regions. Examples are the Bloc Quebecois and
17   the early years of the Reform Party in Canada, or regional parties in the UK (e.g., Scottish
18   National Party, Sinn Féin, Democratic Unionist).

19   A small party could decide to run the same candidate in multiple districts, such as a portion or all
20   of a major city, or several adjacent rural ridings. If a candidate for this party achieves NVPS
21   votes any excess would be rolled up, just as if they had run in a single district. If a party does
22   much better than expected and all their candidates are elected, this could result in a waste of
23   votes. For example, if a party at the previous election had received 5% of the vote, and so
24   decides to run candidates for 10% of the seats, but unexpectedly receives 20% of the vote in the
25   next election, half their votes would be wasted.

26   ***By-Elections***

27   By-elections are needed to fill seats that are vacated by events such as the death or resignation of
28   a Representative. They can be performed as a FPP election in the District that the former
29   member won in. In the worst case, a Candidate elected at the Top Level District would require a
30   jurisdiction-wide vote.

1   *Redistricting*

2   The closest activity to Redistricting in Geographic PR is the recalculation of the district
3   hierarchy. While it is beneficial to keep Districts balanced with respect to population the end
4   result will still be that Seat totals for each party closely match their vote totals even if the
5   addition of new Basic Districts and recalculation of the hierarchy is not done for many years or is
6   done by the most Machiavellian of politicians.

7   ## Benefits of Geographic PR

8   Geographic PR provides a number of benefits compared with current electoral systems
9   (somewhat reduced if Special Districts are used):

10   • It provides a level of fairness about as high as pure PR. NVPS votes for the same party or
11   candidate will get one Seat. Unfairness is limited to situations where an independent or
12   small party gets less than NVPS votes, and all their votes are wasted.

13   • It eliminates the party list needed by PR systems.

14   • It provides a geographical connection to most Representatives.

15   • It guarantees Electors a Representative from the party they voted for, as long as that party
16   won at least NVPS votes.

17   • It reduces the need for redistricting by allowing the addition of Seats to a Parliament
18   without new Districts.

19   • The system is simple enough that results could be verified by anyone with a simple
20   software application, a spreadsheet or even by hand as long as the hierarchy and
21   Candidate/Party vote totals from each Basic District are provided.

22   • The system can easily be used in jurisdictions that currently use FPP voting.

23   • It can accommodate *Special Districts* that are so large and sparsely populated as to
24   require an individual Representative.

25   Aspects of the system that will be considered disadvantages by some are:

26   • It will not provide a single Representative in most Basic Districts.

27   • Every elector will have at least one Representative in Parliament for each Party
28   significant enough to win one or more Seats.

29   • There may be multiple representatives elected to one Super District, sometimes from the
30   same Party, particularly at higher levels of the hierarchy.

1
2 • Like all PR systems it will result in more minority governments reflecting the reality that Parties in a multi-party system rarely get more than 50% of the total vote.

3
4 • It may further encourage minority governments by eliminating the need for "strategic voting".

5 • It is more complex to understand than either FPP or Pure PR.

6
7 • By-elections for the minority of candidates elected at the top level may need to be jurisdiction-wide.

8