Instructions for plotting SIMMAP output

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These are brief instructions for plotting the result of a SIMMAP (v.1.5, `http://simmap.com`) analysis (ancestral state reconstruction over an MCMC-sample of trees) on a target tree (e.g., a majority-rule consensus).

For the impatient

1. Edit the `PlotSimMap.R` file (at a minimum, specify the name of tree file)
2. `$ perl SplitStatFile.pl SIMMAP_file`
3. `$ R --no-save < PlotSimMap.R`

1 Requirements

1.1 R

The statistical software package `R` needs to be installed.
See this link for installation: `http://ftp.sunet.se/pub/lang/CRAN`.
Another good alternative is `http://www.rstudio.com/ide/download`.

1.1.1 R add-on package `phyloch`

Download and install the `R` package `phyloch` from
`http://www.christophheibl.de/Rpackages.html`.

1.2 Perl

Make sure `Perl` is installed on your computer.
For MS Windows, this is a good start: `http://www.activestate.com/activeperl`.

1.3 Program files `SplitStatFile.pl` and `PlotSimMap.R`

The Perl script `SplitStatFile.pl` and the R script `PlotSimMap.R` are necessary. They can be placed in the same folder as the SIMMAP output file.

2 Input

Two files are needed for the input to the plotting scripts:

1. A NEXUS-formatted tree file with the tree to be plotted. The NEXUS format need to have a taxon translation table. See example tree file below.
2. The output from the SIMMAP analysis, here called `SIMMAP_file`. See example `SIMMAP_file` below.

3 Output

The Perl script `SplitStatFile.pl` will split the `SIMMAP_file` in two files, one `bip.txt` file with the taxon bipartition table, and one `chars.txt` file with the character frequencies for the corresponding nodes (one taxon bipartition corresponds to one node in a tree). These files will serve as input to the R script `PlotSimMap.R`.

After running the R script `PlotSimMap.R`, several files are generated. One is a plot of the tree file with node numbers (named `<treefile>`.pdf) in PDF format, and then there will be one or several tree plots (one file per character) with node pie-charts showing the frequencies of character reconstructions on the target tree. These files are named `Char.<charnr>.svg`, and are in SVG format that can be imported and edited in, e.g., Adobe Illustrator or Inkscape. Finally, the R script prints out a file with the character frequencies and the corresponding SIMMAP- and R-node numbers, one per character, and named `Char.<charnr>.txt`. The R-node numbers are also given in the `<treefile>.pdf`. Note that not all columns have a header label, and that characters states are in order (0, 1, 2, ..., N). See example table file below.

4 Usage

1. Put the Perl and R scripts together with the tree file and SIMMAP-output file in the same working directory.
2. Edit `PlotSimMap.R` with a text editor to give the correct name of the tree file. If needed (most probably!), you may want to edit some of the plotting options to make a nicer output.
3. Run the Perl script from a terminal window and give the SIMMAP file as input. This step will create two files in the current working directory, `chars.txt`, and `bip.txt` (note that if you have other files named `chars.txt` and `bip.txt` in the current working directory, they will be overwritten without warnings!):

   ```
   perl SplitStatFile.pl SIMMAP_file
   ```

4. Run the R script from a terminal window. The script will use the `chars.txt`, `bip.txt`, and tree file as input so they need to be in the same directory. Some alternative ways to run the R script:
   (a) In a terminal window, type

   ```
   R --no-save < PlotSimMap.R
   ```

   (b) Or from within R, type

   ```
   source("PlotSimMap.R")
   ```

5. Done! Look in the current working directory for newly created txt and pdf files.

4.1 Changing plotting parameters in `PlotSimMap.R`

The plots generated by the R script can be altered in a large number of ways. The most basic settings are written as variables in the R code and can be changed easily. Note that the script needs to be re-run after the changes. Here are some examples:

```
treefile <- "croc2.tre"
bipartitionfile <- "bip.txt"
charsfile <- "chars.txt"
col0 <- "white" # the color for the first character in pie
```

```
col1 <- "red" # the color for the second character in pie
col2 <- "blue"
col3 <- "green"
col4 <- "purple"
col5 <- "orange"
col6 <- "gray"
pie.col <- c(col0, col1, col2, col3, col4, col5, col6)
pie.cex <- 0.5 # the cex, Character EXpansion (relative size), for the pie charts
tipcex <- 0.5 # the cex for the tip labels
nodenumbercex <- 0.2 # the cex for the node numbers
pdfwidth <- 10 # the width of the plotting size in inches
pdfheight <- 12 # the height of the plotting size in inches
labeloffset <- 0.01 # the space between the tip and the tip label
```

4.2 Changing from SVG to PDF output

If the SVG format doesn't work, or if you want PDF as the output format for the trees with pie charts, edit the code in `PlotSimMap.R` as below and rerun the R script:

Change from:

```
#pdf(file = outpdf, width = pdfwidth, height = pdfheight)
svg(file = outsvg, width = pdfwidth, height = pdfheight)
```

to:

```
pdf(file = outpdf, width = pdfwidth, height = pdfheight)
#svg(file = outsvg, width = pdfwidth, height = pdfheight)
```

4.3 Experimenting with plot width on SVG device

I've experienced problems (bugs?) using `plot.phylo()` on the SVG device that where circumvented using the `no.margin` option to `plot.phylo()`. Hence, if the tree is "too wide" (i.e., the taxon labels are plotted outside the plotting area), try either of these two options:

```
plot(tre, cex = tipcex, label.offset = labeloffset, no.margin = TRUE)
plot(tre, cex = tipcex, label.offset = labeloffset, no.margin = FALSE)
```

Example SIMMAP_file (input for the scripts)

```
[Key to clade IDs. Membership in a clade is indicated by 1 and 0 for absence. The order from left to right is the same as as the tree transl
1: 001111111111111111111111111111111111111111111111111111111111111111111111111111111111
2: 000111111111111111111111111111111111111111111111111111111111111111111111111111111111
3: 000111110000001111111111111111111111111111111111111111111111111111111111111111111111
4: 000011110000001111111111111111111111111111111111111111111111111111111111111111111111
5: 000011000000000000000000000000000000000000000000000000000000000000000000000000000000
6: 000000110000001111111111111111111111111111111111111111111111111111111111111111111111
7: 000000010000001111111111111111111111111111111111111111111111111111111111111111111111
8: 000000000000001000000000000000000000000000000000001111111111111111111111111011111111
9: 000000000000000000000000000000000000000000000000001111111111111111111111111011111111
10: 000000000000000000000000000000000000000000000000001111111111111111111111011011111111
11: 000000000000000000000000000000000000000000000000001111111111111111111110011011111111
12: 000000000000000000000000000000000000000000000000001111111111111111101000011011111111
13: 000000000000000000000000000000000000000000000000001111111111111111001000011011111111
14: 000000000000000000000000000000000000000000000000001111111111111111000000011011111111
15: 000000000000000000000000000000000000000000000000000000000101111111000000011000000000
16: 000000000000000000000000000000000000000000000000000000000100000000000000011000000000
17: 000000000000000000000000000000000000000000000000000000000000000000000000011000000000
18: 000000000000000000000000000000000000000000000000000000000001111110000000000000000000
19: 000000000000000000000000000000000000000000000000000000000001111100000000000000000000
20: 000000000000000000000000000000000000000000000000000000000001110110000000000000000000
21: 000000000000000000000000000000000000000000000000000000000000010010000000000000000000
22: 000000000000000000000000000000000000000000000000000000000001100100000000000000000000
23: 000000000000000000000000000000000000000000000000000000000000100100000000000000000000
24: 000000000000000000000000000000000000000000000000001111111010000000000000000011111111
25: 000000000000000000000000000000000000000000000000000000111010000000000000000000000000
26: 000000000000000000000000000000000000000000000000000000110000000000000000000000000000
27: 000000000000000000000000000000000000000000000000000000001010000000000000000000000000
28: 000000000000000000000000000000000000000000000000001111000000000000000000000011111111
29: 000000000000000000000000000000000000000000000000001111000000000000000000000011111111
30: 000000000000000000000000000000000000000000000000000010000000000000000000000010010001
31: 000000000000000000000000000000000000000000000000000010000000000000000000000010000001
32: 000000000000000000000000000000000000000000000000000010000000000000000000000010000000
33: 000000000000000000000000000000000000000000000000001101000000000000000000000001101110
34: 000000000000000000000000000000000000000000000000000101000000000000000000000000101110
35: 000000000000000000000000000000000000000000000000000101000000000000000000000000001110
36: 000000000000000000000000000000000000000000000000000100000000000000000000000000001110
37: 000000000000000000000000000000000000000000000000000100000000000000000000000000001100
38: 000000000000000000000000000000000000000000000000000000000000000000000000000000001100
39: 000000000000000000000000000000000000000000000000001000000000000000000000000001000000
40: 000000000000000000000000000000000000000000000000000000000000000000010110000000000000
41: 000000000000000000000000000000000000000000000000000000000000000000010010000000000000
42: 000000010000000111111111111111111111111111111111100000000000000000000000000100000000
43: 000000000000000111111111111111111111111111111111100000000000000000000000000000000000
44: 000000000000000000011111111111111111111111111111100000000000000000000000000000000000
45: 000000000000000000000011111111111111111111111111100000000000000000000000000000000000
46: 000000000000000000000011111100110111111111111111100000000000000000000000000000000000
47: 000000000000000000000011111100000101011111111111100000000000000000000000000000000000
48: 000000000000000000000011111100000100011111111111100000000000000000000000000000000000
49: 000000000000000000000011111100000000011111111111100000000000000000000000000000000000
50: 000000000000000000000011111000000000011111111111100000000000000000000000000000000000
51: 000000000000000000000011110000000000011111111111100000000000000000000000000000000000
52: 000000000000000000000011100000000000011111111111100000000000000000000000000000000000
53: 000000000000000000000001100000000000000000000000000000000000000000000000000000000000
54: 000000000000000000000010000000000000011111111111100000000000000000000000000000000000
55: 000000000000000000000000000000000000011111111111100000000000000000000000000000000000
56: 000000000000000000000000000000000000001111111111100000000000000000000000000000000000
57: 000000000000000000000000000000000000000000011110000000000000000000000000000000000000
58: 000000000000000000000000000000000000000000000110000000000000000000000000000000000000
59: 000000000000000000000000000000000000000000011000000000000000000000000000000000000000
60: 000000000000000000000000000000000000001111100001100000000000000000000000000000000000
61: 000000000000000000000000000000000000000001100000000000000000000000000000000000000000
62: 000000000000000000000000000000000000001110000001100000000000000000000000000000000000
63: 000000000000000000000000000000000000001110000000000000000000000000000000000000000000
64: 000000000000000000000000000000000000000110000000000000000000000000000000000000000000
65: 000000000000000000000000000000000000000000000001100000000000000000000000000000000000
66: 000000000000000000000000000000110010100000000000000000000000000000000000000000000000
67: 000000000000000000000000000000100010100000000000000000000000000000000000000000000000
68: 000000000000000000000000000000100010000000000000000000000000000000000000000000000000
69: 000000000000000000000000000011001000000000000000000000000000000000000000000000000000
70: 000000000000000000000000000010001000000000000000000000000000000000000000000000000000
71: 000000000000000000011100000000000000000000000000000000000000000000000000000000000000
72: 000000000000000000001100000000000000000000000000000000000000000000000000000000000000
73: 000000000000000111100000000000000000000000000000000000000000000000000000000000000000
74: 000000000000000110100000000000000000000000000000000000000000000000000000000000000000
75: 000000000000000100100000000000000000000000000000000000000000000000000000000000000000
```

```
76: 000000010000000000000000000000000000000000000000000000000000000000000000000100000000
77: 000000001111110000000000000000000000000000000000000000000000000000000000000000000000
78: 000000001011110000000000000000000000000000000000000000000000000000000000000000000000
79: 000000000011110000000000000000000000000000000000000000000000000000000000000000000000
80: 000000000001110000000000000000000000000000000000000000000000000000000000000000000000
81: 000000000000110000000000000000000000000000000000000000000000000000000000000000000000
82: 000000001100000000000000000000000000000000000000000000000000000000000000000000000000
83: 011111110000001111111111111111111111111111111111111111111111111111111111111111111111
84: 001111110000001111111111111111111111111111111111111111111111111111111111111111111111
85: 000111000000000000000000000000000000000000000000000000000000000000000000000000000000
86: 000000000000000000000000000000000000000000000000011111111111111111111110111011111111
87: 000000000000000000000000000000000000000000000000011111111111111110000000000011111111
88: 000000000000000000000000000000000000000000000000000000000101111110000000000000000000
89: 000000000000000000000000000000000000000000000000000000000001100000000000000000000000
90: 000000000000000000000000000000000000000000000000000000000000000000000000000010000001
91: 000000000000000000000000000000000000000000000000001100000000000000000000000001101110
92: 000000000000000000000000000000000000000000000000000100000000000000000000000000101110
93: 000000000000000000010011111111111111111111111111000000000000000000000000000000000000
94: 000000000000000000000011111110110111111111111111000000000000000000000000000000000000
95: 000000000000000000000011111100110110111111111111000000000000000000000000000000000000
96: 000000000000000000000000000000000000001110011111000000000000000000000000000000000000
97: 000000000000000000000000000001001000000000000000000000000000000000000000000000000000
98: 000000000000000111000000000000000000000000000000000000000000000000000000000000000000
99: 000000000000000110000000000000000000000000000000000000000000000000000000000000000000
100: 000000010000000111111111111111111111111111111111111111111111111111111111111111111111
101: 000000000000000000000000000000000000000000000000000000000000000000000110000000000000
102: 000000000000000000000000000000000000000000000000000000111000000000000000000000000000
103: 000000000000000000000000000000000000000000000000011111000010000000000000000111111111
104: 000000000000000000000000000000000000000000000000000111000000000000000000000111111111
105: 000000000000000000000000000000000000000000000000000011000000000000000000000010010001
106: 000000000000000000000000000000000000000000000000000010000000000000000000000000000001
107: 000000000000000000000000000000000000000000000000000100000000000000000000000001101110
108: 000000000000000000000000000000000000000000000000000100000000000000000000000001001110
109: 000000000000000000000000000000000000000000000000000100000000000000000000000000000100
110: 000000000000000000000000000000000000000000000000000000000001100110000000000000000000
111: 000000010000000111111111111111111111111111111111100000000000000000000000000000000000
112: 000000000000000000000000000011000000000000000000000000000000000000000000000000000000
113: 000000000000000000000011111001101100111111111111100000000000000000000000000000000000
114: 000000000000000000000000000000000000000000010110000000000000000000000000000000000000
115: 000000000000000000000000000001100100000000000000000000000000000000000000000000000000
116: 000000000000000000000000000000000001100000000000000000000000000000000000000000000000
117: 000000000111110000000000000000000000000000000000000000000000000000000000000000000000
118: 011000000000000000000000000000000000000000000000000000000000000000000000000000000000
119: 010111111111111111111111111111111111111111111111111111111111111111111111111111111111
120: 000000000000000000111111111111111111111111111111100000000000000000000000000000000000
121: 000000000000000000000000000000000000000000001110000000000000000000000000000000000000
122: 000000000000000000000011100000000000000000000000000000000000000000000000000000000000
123: 000000000000000000000000000011000000000000000000000000000000000000000000000000000000
124: 000000000000000000000000000000110011100000000000000000000000000000000000000000000000
125: 000000000000000000000000000000110000000000000000000000000000000000000000000000000000
126: 000000000000000000000000000000000000000000000000011111111110000000000000011011111111
127: 000000000000000000000000000000000000000000000000011111111110000000000000000011111111
128: 000000000000000000000000000000000000000000000000011111001010000000000000000011111111
129: 000000000000000000000000000000000000000000000000011111001000000000000000000011111111
130: 000000000000000000000000000000000000000000000000000010000000000000000000000001000000
131: 000000000000000000000000000000000000000000000000001110000000000000000000000010111111
132: 000000000000000000000000000000000000000000000000000110000000000000000000000000101110
133: 000000000000000000000000000000000000000000000000000010000000000000000000000000001010
134: 000000000000000000000000000000000000000000000000000010000000000000000000000000000010
135: 000000000000000000000000000000000000000000000000000000000000000000101000000000000000
136: 000111101111110000000000000000000000000000000000000000000000000000000000000000000000
137: 000111100000000000000000000000000000000000000000000000000000000000000000000000000000
138: 111111111111111111111111111111111111111111111111111111111111111111111111111111111111
]
Site Clade N Pr(0) Pr(1) Pr(2) Pr(3) Pr(4) Pr(5) Pr(6)
1 1 1 0.846455 0.153545 - - - - -
1 2 3 0.942550 0.057450 - - - - -
1 3 3 0.988139 0.011861 - - - - -
1 4 1 0.992003 0.007997 - - - - -
1 5 4 0.847206 0.152794 - - - - -
1 6 3 0.935941 0.064059 - - - - -
1 7 4 0.577324 0.422676 - - - - -
1 8 2 0.678172 0.321828 - - - - -
1 9 4 0.926019 0.073981 - - - - -
1 10 3 0.991702 0.008298 - - - - -
1 11 4 0.973684 0.026316 - - - - -
1 12 4 0.773141 0.226859 - - - - -
1 13 3 0.543017 0.456983 - - - - -
1 14 4 0.613438 0.386562 - - - - -
1 15 2 0.856238 0.143762 - - - - -
1 16 1 0.828790 0.171210 - - - - -
```

1	17	4	0.487174	0.512826	-	-	-	-	-
1	18	4	0.947905	0.052095	-	-	-	-	-
1	19	4	0.990156	0.009844	-	-	-	-	-
1	20	4	0.970810	0.029190	-	-	-	-	-
1	21	3	0.785050	0.214950	-	-	-	-	-
1	22	4	0.948836	0.051164	-	-	-	-	-
1	23	2	0.818883	0.181117	-	-	-	-	-
1	24	4	0.158583	0.841417	-	-	-	-	-
1	25	2	0.214729	0.785271	-	-	-	-	-
1	26	4	0.438404	0.561596	-	-	-	-	-
1	27	2	0.500000	0.500000	-	-	-	-	-
1	28	4	0.011761	0.988239	-	-	-	-	-
1	29	4	0.024692	0.975308	-	-	-	-	-
1	30	4	0.998431	0.001569	-	-	-	-	-
1	31	4	0.999926	0.000074	-	-	-	-	-
1	32	1	0.999983	0.000017	-	-	-	-	-
1	33	2	0.000759	0.999241	-	-	-	-	-
1	34	1	0.000199	0.999801	-	-	-	-	-
1	35	1	0.000544	0.999456	-	-	-	-	-
1	36	4	0.000044	0.999956	-	-	-	-	-
1	37	3	0.000002	0.999998	-	-	-	-	-
1	38	2	0.000010	0.999990	-	-	-	-	-
1	39	2	0.000259	0.999741	-	-	-	-	-
1	40	4	0.982103	0.017897	-	-	-	-	-
1	41	2	0.898559	0.101441	-	-	-	-	-
1	42	4	0.091250	0.908750	-	-	-	-	-
1	43	4	0.003115	0.996885	-	-	-	-	-
1	44	4	0.024401	0.975599	-	-	-	-	-
1	45	4	0.135010	0.864990	-	-	-	-	-
1	46	4	0.031870	0.968130	-	-	-	-	-
1	47	1	0.003820	0.996180	-	-	-	-	-
1	48	4	0.003192	0.996808	-	-	-	-	-
1	49	4	0.001734	0.998266	-	-	-	-	-
1	50	3	0.000272	0.999728	-	-	-	-	-
1	51	4	0.002676	0.997324	-	-	-	-	-
1	52	4	0.000416	0.999584	-	-	-	-	-
1	53	4	0.000375	0.999625	-	-	-	-	-
1	54	3	0.000215	0.999785	-	-	-	-	-
1	55	4	0.010376	0.989624	-	-	-	-	-
1	56	4	0.000329	0.999671	-	-	-	-	-
1	57	4	0.000133	0.999867	-	-	-	-	-
1	58	4	0.001290	0.998710	-	-	-	-	-
1	59	2	0.000352	0.999648	-	-	-	-	-
1	60	2	0.000226	0.999774	-	-	-	-	-
1	61	4	0.000178	0.999822	-	-	-	-	-
1	62	4	0.002090	0.997910	-	-	-	-	-
1	63	4	0.003681	0.996319	-	-	-	-	-
1	64	4	0.030671	0.969329	-	-	-	-	-
1	65	4	0.000164	0.999836	-	-	-	-	-
1	66	2	0.064067	0.935933	-	-	-	-	-
1	67	2	0.500000	0.500000	-	-	-	-	-
1	68	3	0.500000	0.500000	-	-	-	-	-
1	69	3	0.823984	0.176016	-	-	-	-	-
1	70	2	0.870419	0.129581	-	-	-	-	-
1	71	3	0.048433	0.951567	-	-	-	-	-
1	72	4	0.032353	0.967647	-	-	-	-	-
1	73	3	0.000722	0.999278	-	-	-	-	-
1	74	2	0.001652	0.998348	-	-	-	-	-
1	75	1	0.000178	0.999822	-	-	-	-	-
1	76	2	0.093372	0.906628	-	-	-	-	-
1	77	4	0.897710	0.102290	-	-	-	-	-
1	78	1	0.940853	0.059147	-	-	-	-	-
1	79	4	0.950007	0.049993	-	-	-	-	-
1	80	4	0.979715	0.020285	-	-	-	-	-
1	81	4	0.997505	0.002495	-	-	-	-	-
1	82	1	0.776183	0.223817	-	-	-	-	-
1	83	1	0.789042	0.210958	-	-	-	-	-
1	84	1	0.727295	0.272705	-	-	-	-	-
1	85	3	0.998262	0.001738	-	-	-	-	-
1	86	1	0.935480	0.064520	-	-	-	-	-
1	87	1	0.416372	0.583628	-	-	-	-	-
1	88	2	0.849674	0.150326	-	-	-	-	-
1	89	2	0.966228	0.033772	-	-	-	-	-
1	90	2	0.999970	0.000030	-	-	-	-	-
1	91	1	0.000023	0.999977	-	-	-	-	-
1	92	2	0.000336	0.999664	-	-	-	-	-
1	93	1	0.157085	0.842915	-	-	-	-	-
1	94	1	0.091751	0.908249	-	-	-	-	-
1	95	1	0.003903	0.996097	-	-	-	-	-
1	96	2	0.000155	0.999845	-	-	-	-	-
1	97	1	0.913168	0.086832	-	-	-	-	-

```
1 98 2 0.000666 0.999334 - - - - -
1 99 3 0.003970 0.996030 - - - - -
1 100 2 0.417604 0.582396 - - - - -
1 101 2 0.988304 0.011696 - - - - -
1 102 1 0.189080 0.810920 - - - - -
1 103 1 0.047483 0.952517 - - - - -
1 104 1 0.159231 0.840769 - - - - -
1 105 1 0.977069 0.022931 - - - - -
1 106 1 0.999978 0.000022 - - - - -
1 107 1 0.003419 0.996581 - - - - -
1 108 1 0.000150 0.999850 - - - - -
1 109 1 0.000000 1.000000 - - - - -
1 110 1 0.942852 0.057148 - - - - -
1 111 2 0.015141 0.984859 - - - - -
1 112 1 0.996133 0.003867 - - - - -
1 113 1 0.005544 0.994456 - - - - -
1 114 1 0.000045 0.999955 - - - - -
1 115 2 0.283548 0.716452 - - - - -
1 116 2 0.293013 0.706987 - - - - -
1 117 2 0.912786 0.087214 - - - - -
1 118 1 0.684587 0.315413 - - - - -
1 119 1 0.860237 0.139763 - - - - -
1 120 1 0.000577 0.999423 - - - - -
1 121 1 0.001005 0.998995 - - - - -
1 122 1 0.000468 0.999532 - - - - -
1 123 1 0.004312 0.995688 - - - - -
1 124 1 0.066050 0.933950 - - - - -
1 125 1 0.500000 0.500000 - - - - -
1 126 1 0.241534 0.758466 - - - - -
1 127 1 0.061396 0.938604 - - - - -
1 128 1 0.032700 0.967300 - - - - -
1 129 1 0.028383 0.971617 - - - - -
1 130 1 0.010210 0.989790 - - - - -
1 131 1 0.118429 0.881571 - - - - -
1 132 1 0.000933 0.999067 - - - - -
1 133 1 0.000013 0.999987 - - - - -
1 134 1 0.000011 0.999989 - - - - -
1 135 1 0.549146 0.450854 - - - - -
1 136 1 0.993707 0.006293 - - - - -
1 137 1 0.997785 0.002215 - - - - -
1 138 4 0.728112 0.271888 - - - - -
7 1 1 0.907007 0.092466 0.000526 - - - -
7 2 3 0.950463 0.049397 0.000139 - - - -
7 3 3 0.986085 0.013897 0.000019 - - - -
7 4 1 0.983748 0.016231 0.000021 - - - -
7 5 4 0.955997 0.043944 0.000059 - - - -
7 6 3 0.931547 0.068365 0.000087 - - - -
7 7 4 0.931188 0.068746 0.000066 - - - -
7 8 2 0.964604 0.035358 0.000038 - - - -
7 9 4 0.939797 0.060127 0.000077 - - - -
7 10 3 0.959540 0.040406 0.000054 - - - -
7 11 4 0.984429 0.015551 0.000020 - - - -
7 12 4 0.945915 0.054020 0.000065 - - - -
7 13 3 0.921741 0.078172 0.000087 - - - -
7 14 4 0.939704 0.060238 0.000058 - - - -
7 15 2 0.939765 0.060170 0.000065 - - - -
7 16 1 0.924410 0.075486 0.000104 - - - -
7 17 4 0.910436 0.089457 0.000107 - - - -
7 18 4 0.949588 0.050345 0.000067 - - - -
7 19 4 0.960274 0.039671 0.000054 - - - -
7 20 4 0.972046 0.027915 0.000038 - - - -
7 21 3 0.943263 0.056659 0.000078 - - - -
7 22 4 0.980627 0.019347 0.000027 - - - -
7 23 2 0.954936 0.045002 0.000062 - - - -
7 24 4 0.907372 0.092594 0.000034 - - - -
7 25 2 0.747824 0.252109 0.000067 - - - -
7 26 4 0.457378 0.542550 0.000071 - - - -
7 27 2 0.753883 0.245987 0.000129 - - - -
7 28 4 0.994928 0.005067 0.000005 - - - -
7 29 4 0.999262 0.000737 0.000001 - - - -
7 30 4 0.999967 0.000033 0.000000 - - - -
7 31 4 0.999962 0.000038 0.000000 - - - -
7 32 1 0.999993 0.000007 0.000000 - - - -
7 33 2 0.998948 0.001052 0.000000 - - - -
7 34 1 0.974219 0.025779 0.000002 - - - -
7 35 1 0.050967 0.949030 0.000003 - - - -
7 36 4 0.001884 0.998116 0.000000 - - - -
7 37 3 0.000005 0.999995 0.000000 - - - -
7 38 2 0.000030 0.999970 0.000000 - - - -
7 39 2 0.999394 0.000606 0.000000 - - - -
7 40 4 0.993891 0.006101 0.000008 - - - -
```

7	41	2	0.976715	0.023253	0.000032	-	-	-	-
7	42	4	0.819001	0.180880	0.000120	-	-	-	-
7	43	4	0.576858	0.423045	0.000096	-	-	-	-
7	44	4	0.844996	0.154866	0.000138	-	-	-	-
7	45	4	0.849245	0.150622	0.000132	-	-	-	-
7	46	4	0.826292	0.173583	0.000125	-	-	-	-
7	47	1	0.790918	0.208967	0.000115	-	-	-	-
7	48	4	0.798985	0.200901	0.000115	-	-	-	-
7	49	4	0.776786	0.223106	0.000108	-	-	-	-
7	50	3	0.726781	0.273123	0.000096	-	-	-	-
7	51	4	0.673494	0.326431	0.000074	-	-	-	-
7	52	4	0.548476	0.451497	0.000027	-	-	-	-
7	53	4	0.960966	0.039017	0.000017	-	-	-	-
7	54	3	0.126510	0.873481	0.000009	-	-	-	-
7	55	4	0.917669	0.082268	0.000063	-	-	-	-
7	56	4	0.997503	0.002495	0.000002	-	-	-	-
7	57	4	0.999873	0.000127	0.000000	-	-	-	-
7	58	4	0.999641	0.000358	0.000000	-	-	-	-
7	59	2	0.999911	0.000089	0.000000	-	-	-	-
7	60	2	0.993953	0.006044	0.000003	-	-	-	-
7	61	4	0.999668	0.000332	0.000000	-	-	-	-
7	62	4	0.834834	0.165116	0.000050	-	-	-	-
7	63	4	0.730188	0.269687	0.000125	-	-	-	-
7	64	4	0.888753	0.111094	0.000152	-	-	-	-
7	65	4	0.002053	0.997946	0.000000	-	-	-	-
7	66	2	0.842210	0.157653	0.000137	-	-	-	-
7	67	2	0.888753	0.111094	0.000152	-	-	-	-
7	68	3	0.888753	0.111094	0.000152	-	-	-	-
7	69	3	0.872913	0.126947	0.000140	-	-	-	-
7	70	2	0.888753	0.111094	0.000152	-	-	-	-
7	71	3	0.879124	0.120732	0.000144	-	-	-	-
7	72	4	0.883344	0.116505	0.000151	-	-	-	-
7	73	3	0.422909	0.577019	0.000072	-	-	-	-
7	74	2	0.163126	0.836846	0.000028	-	-	-	-
7	75	1	0.011664	0.988334	0.000002	-	-	-	-
7	76	2	0.791017	0.208848	0.000135	-	-	-	-
7	77	4	0.949955	0.049961	0.000084	-	-	-	-
7	78	1	0.977120	0.022848	0.000031	-	-	-	-
7	79	4	0.980824	0.019150	0.000026	-	-	-	-
7	80	4	0.993025	0.006965	0.000010	-	-	-	-
7	81	4	0.999255	0.000744	0.000001	-	-	-	-
7	82	1	0.940074	0.059844	0.000082	-	-	-	-
7	83	1	0.901191	0.091911	0.006898	-	-	-	-
7	84	1	0.907608	0.091574	0.000818	-	-	-	-
7	85	3	0.998706	0.001292	0.000002	-	-	-	-
7	86	1	0.950607	0.049325	0.000067	-	-	-	-
7	87	1	0.972420	0.027556	0.000024	-	-	-	-
7	88	2	0.954298	0.045645	0.000057	-	-	-	-
7	89	2	0.988177	0.011807	0.000016	-	-	-	-
7	90	2	0.999987	0.000013	0.000000	-	-	-	-
7	91	1	0.997266	0.002734	0.000000	-	-	-	-
7	92	2	0.962279	0.037718	0.000003	-	-	-	-
7	93	1	0.834332	0.165528	0.000139	-	-	-	-
7	94	1	0.780184	0.219689	0.000127	-	-	-	-
7	95	1	0.740116	0.259765	0.000119	-	-	-	-
7	96	2	0.997302	0.002697	0.000001	-	-	-	-
7	97	1	0.843009	0.156849	0.000141	-	-	-	-
7	98	2	0.241804	0.758155	0.000041	-	-	-	-
7	99	3	0.050559	0.949432	0.000009	-	-	-	-
7	100	2	0.924379	0.075544	0.000077	-	-	-	-
7	101	2	0.996295	0.003700	0.000005	-	-	-	-
7	102	1	0.831874	0.168066	0.000060	-	-	-	-
7	103	1	0.977072	0.022906	0.000023	-	-	-	-
7	104	1	0.999913	0.000087	0.000000	-	-	-	-
7	105	1	0.999564	0.000435	0.000000	-	-	-	-
7	106	1	0.999991	0.000009	0.000000	-	-	-	-
7	107	1	0.994944	0.005056	0.000001	-	-	-	-
7	108	1	0.881140	0.118857	0.000003	-	-	-	-
7	109	1	0.000000	1.000000	0.000000	-	-	-	-
7	110	1	0.978036	0.021934	0.000030	-	-	-	-
7	111	2	0.790600	0.209267	0.000133	-	-	-	-
7	112	1	0.888753	0.111094	0.000152	-	-	-	-
7	113	1	0.876880	0.122996	0.000124	-	-	-	-
7	114	1	0.999982	0.000018	0.000000	-	-	-	-
7	115	2	0.885664	0.114191	0.000145	-	-	-	-
7	116	2	0.886899	0.112954	0.000147	-	-	-	-
7	117	2	0.963056	0.036893	0.000051	-	-	-	-
7	118	1	0.871322	0.102037	0.026641	-	-	-	-
7	119	1	0.909275	0.086252	0.004473	-	-	-	-
7	120	1	0.761446	0.238428	0.000126	-	-	-	-
7	121	1	0.999708	0.000292	0.000000	-	-	-	-

7	122	1	0.410553	0.589432	0.000015	-	-	-	-
7	123	1	0.851701	0.148170	0.000129	-	-	-	-
7	124	1	0.868067	0.131795	0.000138	-	-	-	-
7	125	1	0.888753	0.111094	0.000152	-	-	-	-
7	126	1	0.923529	0.076418	0.000053	-	-	-	-
7	127	1	0.917170	0.082792	0.000038	-	-	-	-
7	128	1	0.974918	0.025066	0.000016	-	-	-	-
7	129	1	0.991957	0.008032	0.000011	-	-	-	-
7	130	1	0.999154	0.000845	0.000001	-	-	-	-
7	131	1	0.999845	0.000154	0.000000	-	-	-	-
7	132	1	0.999728	0.000271	0.000000	-	-	-	-
7	133	1	0.000044	0.999956	0.000000	-	-	-	-
7	134	1	0.000033	0.999967	0.000000	-	-	-	-
7	135	1	0.910031	0.089862	0.000106	-	-	-	-
7	136	1	0.979012	0.020960	0.000028	-	-	-	-
7	137	1	0.986441	0.013540	0.000019	-	-	-	-
7	138	4	0.905187	0.093146	0.001666	-	-	-	-

Example NEXUS tree file (input for the scripts)

```
#NEXUS
begin trees;
translate
1 Glen_Rose_Form1,
2 Bernissartia_fagesii1,
3 Hylaeochampsa_vectiana1,
4 Borealosuchus_formidabilis1,
5 Borealosuchus_wilsoni1,
6 Borealosuchus_acutidentatus1,
7 Borealosuchus_sternbergii1,
8 Leidyosuchus_canadensis1,
9 Thoracosaurus_neocesariensis1,
10 Thoracosaurus_macrorhynchus1,
11 Eogavialis_africanus1,
12 Gryposuchus_colombianus1,
13 Gavialis_lewisi1,
14 Gavialis_gangeticus,
15 Pristichampsus_vorax1,
16 Diplocynodon_hantoniensis1,
17 Diplocynodon_ratelii1,
18 Diplocynodon_darwini1,
19 Baryphracta_deponiae1,
20 Stangerochampsa_mccabei1,
21 Brachychampsa_montana1,
22 Brachychampsa_sealeyi1,
23 Alligator_sinensis,
24 Alligator_mississippiensis,
25 Alligator_mefferdi1,
26 Alligator_olseni1,
27 Alligator_mcgrewi1,
28 Alligator_prenasalis1,
29 Ceratosuchus_burdoshi1,
30 Hassiacosuchus_haupti1,
31 Allognathosuchus_polyodon1,
32 Allognathosuchus_wartheni1,
33 Navajosuchus_mooki1,
34 Wannaganosuchus_brachymanus1,
35 Procaimanoidea_kayi1,
36 Hispanochampsa_mulleri1,
37 Arambourgia_gaudryi1,
38 Eocaiman_cavernensis1,
39 Purussaurus_spp1,
40 Orthogenysuchus_olseni1,
41 Mourasuchus_spp1,
42 Caiman_yacare,
43 Caiman_crocodilus,
44 Caiman_latirostris,
45 Caiman_lutescens1,
46 Melanosuchus_fisheri1,
47 Melanosuchus_niger,
48 Paleosuchus_trigonatus,
49 Paleosuchus_palpebrosus,
50 Crocodylus_cataphractus,
51 Crocodylus_niloticus,
52 Crocodylus_porosus,
53 Crocodylus_rhombifer,
54 Crocodylus_palaeindicus1,
55 Osteolaemus_tetraspis,
56 Crocodylus_robustus1,
57 Crocodylus_lloidi1,
58 Crocodylus_megarhinus1,
59 Euthecodon_arambourgii1,
60 Tomistoma_schlegelii,
61 Tomistoma_lusitanica1,
62 Paratomistoma_courtii1,
63 Gavialosuchus_americanus1,
64 Gavialosuchus_eggenbergensis1,
65 Tomistoma_cairense1,
66 Dollosuchus_spenceri1,
67 Brachyuranochampsa_eversolei1,
68 Dormaal_crocodyloid1,
69 Crocodylus_acer1,
70 Crocodylus_affinis1,
71 Asiatosuchus_grangeri1,
72 Asiatosuchus_germanicus1,
73 Prodiplocynodon_langi1,
74 Australosuchus_clarkae1,
```

```
75 Kembara_implexidens1,
76 Deinosuchus1,
77 Crocodylus_acutus,
78 Crocodylus_palustris,
79 Crocodylus_siamensis,
80 Crocodylus_intermedius,
81 Crocodylus_johnstoni,
82 Crocodylus_mindorensis,
83 Crocodylus_novaeguineae,
84 Crocodylus_moreletii;
tree 2 = (((11:0.060516,((13:0.001407,14:0.000020):0.011854,12:0.022174):0.0
31862):0.074488,(9:0.016113,10:0.019035):0.021246):0.120541,(2:0.124662,((((5:0.
018770,6:0.002756):0.012762,4:0.012793):0.004709,(((((73:0.006232,((67:0.040276,
(69:0.003760,((75:0.010715,74:0.045024):0.021872,((58:0.031545,((63:0.066287,((6
2:0.187401,65:0.032391):0.018042,((61:0.017603,60:0.060102):0.010701,64:0.061773
):0.007147):0.063662):0.074848,66:0.049613):0.031142):0.001893,(((56:0.030943,55
:0.093156):0.035800,(59:0.161053,57:0.005287):0.064919):0.024100,((((53:0.023250
,(77:0.001498,84:0.004924):0.013641):0.013444,80:0.004300):0.035881,(54:0.016242
,(((83:0.004752,(52:0.001137,(81:0.011177,82:0.002019):0.003042):0.001383):0.016
516,79:0.015167):0.012998,(78:0.027431,51:0.034412):0.005548):0.000273):0.002405
):0.050936,50:0.099496):0.012232):0.025445):0.012365):0.088905):0.019784):0.0619
19,(70:0.003600,(68:0.018832,71:0.020914):0.005312):0.012100):0.101648):0.034473
,72:0.054826):0.062362,15:0.166155):0.009257,((((((29:0.055973,((((((26:0.060823
,((25:0.009203,24:0.032778):0.053904,(23:0.003190,(((43:0.008136,42:0.017300):0.
026084,(((47:0.002756,46:0.003797):0.013801,(44:0.006522,45:0.048408):0.001880):
0.008814,((39:0.060756,(40:0.065489,41:0.029553):0.139899):0.021254,(49:0.016249
,48:0.002727):0.107453):0.019651):0.009764):0.126208,38:0.048740):0.194685):0.00
6502):0.020300):0.049967,27:0.023079):0.009782,28:0.006746):0.024174,34:0.006555
):0.019715,(32:0.000414,((31:0.005784,35:0.037822):0.023472,37:0.014627):0.01282
7):0.018252):0.008993,36:0.207839):0.027460):0.000825,(33:0.009360,30:0.034969):
0.002562):0.052493,20:0.050308):0.025469,(21:0.060937,22:0.015234):0.016210):0.1
63691,((18:0.017751,(16:0.004192,17:0.023856):0.008666):0.020290,19:0.095006):0.
026188):0.034631,(76:0.188320,8:0.060302):0.001828):0.081155):0.163209,7:0.06129
5):0.032014):0.202322,3:0.119837):0.016493):0.055818,1:0.054211);
end;
```

Example Char.<nr>.txt table file (output)

```
SIMMAP-node Phylo-node Piedata
3 93 0.988139 0.011861
5 166 0.847206 0.152794
6 94 0.935941 0.064059
7 95 0.577324 0.422676
8 131 0.678172 0.321828
9 132 0.926019 0.073981
11 134 0.973684 0.026316
12 135 0.773141 0.226859
13 136 0.543017 0.456983
14 137 0.613438 0.386562
17 162 0.487174 0.512826
18 156 0.947905 0.052095
19 157 0.990156 0.009844
20 158 0.97081 0.02919
21 161 0.78505 0.21495
22 159 0.948836 0.051164
24 139 0.158583 0.841417
25 152 0.214729 0.785271
26 153 0.438404 0.561596
27 154 0.5 0.5
28 140 0.011761 0.988239
29 141 0.024692 0.975308
30 149 0.998431 0.001569
31 150 0.999926 7.4e-05
33 142 0.000759 0.999241
36 145 4.4e-05 0.999956
37 146 2e-06 0.999998
38 147 1e-05 0.99999
39 148 0.000259 0.999741
40 163 0.982103 0.017897
41 164 0.898559 0.101441
42 96 0.09125 0.90875
43 97 0.003115 0.996885
44 98 0.024401 0.975599
45 100 0.13501 0.86499
46 102 0.03187 0.96813
48 104 0.003192 0.996808
49 105 0.001734 0.998266
50 106 0.000272 0.999728
51 107 0.002676 0.997324
52 108 0.000416 0.999584
53 121 0.000375 0.999625
54 109 0.000215 0.999785
55 110 0.010376 0.989624
56 111 0.000329 0.999671
57 117 0.000133 0.999867
58 118 0.00129 0.99871
59 119 0.000352 0.999648
61 120 0.000178 0.999822
62 113 0.00209 0.99791
63 114 0.003681 0.996319
64 115 0.030671 0.969329
65 116 0.000164 0.999836
66 122 0.064067 0.935933
67 123 0.5 0.5
68 124 0.5 0.5
72 126 0.032353 0.967647
73 127 0.000722 0.999278
76 130 0.093372 0.906628
77 86 0.89771 0.10229
79 87 0.950007 0.049993
80 88 0.979715 0.020285
81 89 0.997505 0.002495
82 90 0.776183 0.223817
83 91 0.789042 0.210958
84 92 0.727295 0.272705
85 165 0.998262 0.001738
86 133 0.93548 0.06452
87 138 0.416372 0.583628
88 155 0.849674 0.150326
89 160 0.966228 0.033772
90 151 0.99997 3e-05
91 143 2.3e-05 0.999977
92 144 0.000336 0.999664
93 99 0.157085 0.842915
94 101 0.091751 0.908249
```

```
95 103 0.003903 0.996097
96 112 0.000155 0.999845
97 125 0.913168 0.086832
98 128 0.000666 0.999334
99 129 0.00397 0.99603
138 85 0.728112 0.271888
```