

new2view, v. 0.13: Display Phylogenies

Bernhard Haubold

Max-Planck-Institute for Evolutionary Biology, Plön, Germany

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1 Introduction

The program `new2view` draws phylogenetic trees specified in the “Newick” format. This is a human-readable notation for phylogenetic trees; a tree with tree taxa, *A*, *B*, and *C*, is written like this

```
( (A,B) , C ) ;
```

The leaves are denoted by their labels, while internal nodes are denoted by round brackets; the root node is followed by a semi-colon. When drawn with `new2view` it looks like in Figure 1A. This tree contains no explicit branch lengths, so all branches are drawn with length 1. Branch lengths can be added by writing a colon to the right of a node marker, followed by the distance from that node to its parent, for example,

```
( (A:0.2,B:0.25) :1,C:1.2) ;
```

`New2view` converts this to Figure 1B.

In addition to distances, individual nodes can also be labeled, for example with support values. Say the parent node of *A* and *B* in our example tree has support value 98, then we write this in square brackets behind the node marker

```
( (A:0.2,B:0.25) [98] :1,C:1.2) ;
```

which `new2view` converts to Figure 1C.

2 Getting Started

`new2view` was written in C on a computer running Linux and should work on any UNIX system. However, please contact me at haubold@evolbio.mpg.de if you have any problems with the program.

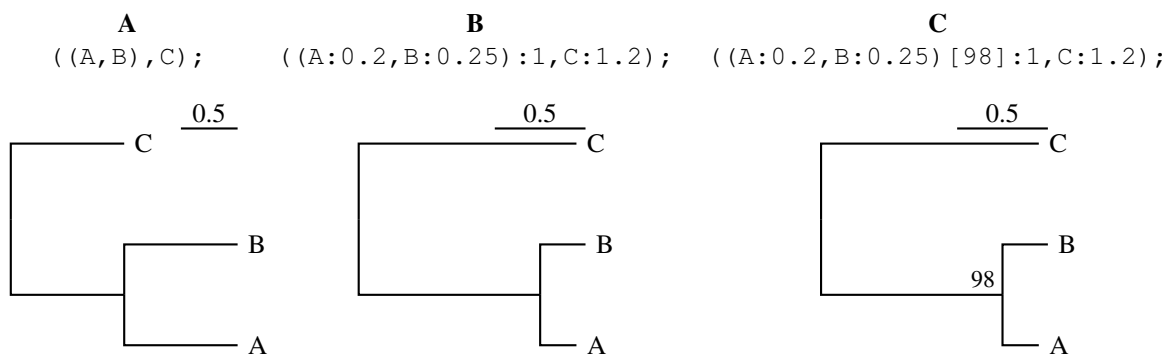


Figure 1: Three example trees drawn with `new2view`. (A) has no explicit branch lengths, while (B) does have them; (C) differs from (B) by the addition of the support value 98.

- Unpack the program

```
tar -xvzf new2view_XXX.tgz
```

where XXX indicates the version.

- Change into the newly created directory

```
cd New2view_XXX
```

and list its contents

```
ls
```

- Generate new2view

```
make
```

- List its options

```
./new2view -h
```

- Test the program

```
./new2view -d 3 -s 0.5 test1.nwk
```

where option `-d` specifies the largest dimension of the tree in cm, and option `-s` the length of the scale bar. The result is Figure 1A.

- To get Figure 1B, enter

```
./new2view -d 3 -s 0.5 test2.nwk
```

- Finally, Figure 1C is generated with

```
./new2view -d 3 -s 0.5 test3.nwk
```

3 Tutorial

- The trees shown in Figure 1 are rooted. However, many algorithms for constructing phylogenies generate unrooted trees. The file `test4.nwk` contains such an unrooted phylogeny generated with neighbor joining algorithm. To draw this tree, enter

```
./new2view test3.nwk
```

and get Figure 2A. This radial representation is standard for unrooted trees, but the labels are difficult to read.

- Mathematically speaking even “unrooted” trees are in fact rooted, and `new2view` can draw them accordingly

```
new2view -r test3.nwk
```

to return Figure 2B.

- The labels are legible now, but this is not how a biologist would root a tree. Instead, midpoint rooting is often used to place a root in the middle between the two most distant leaves. This procedure is implemented in my program `midRoot` and we can enter

```
midRoot test3.nwk | new2view -s 0.2
```

to get Figure 2C.

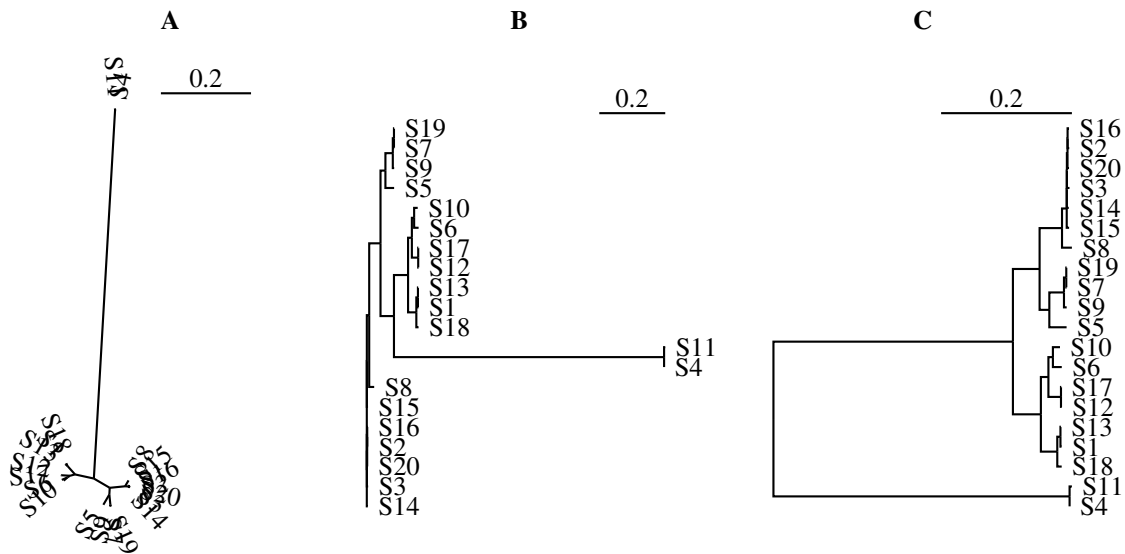


Figure 2: Rooting a tree. (A) Unrooted, radial layout; (B) rooting on the default root; (C) midpoint rooted.

4 Listing

The following listing documents the driver program for new2view.

```

1  /***** new2view.c *****/
   * Description:
   * Author: Bernhard Haubold, haubold@evolbio.mpg.de
   * Date: Fri Sep 21 15:15:59 2012
   *****/
6  #include <stdio.h>
   #include <stdlib.h>
   #include <string.h>
   #include <stdarg.h>
   #include "interface.h"
11  #include "eprintf.h"
   #include "tree.h"

   void scanFile(FILE *fp, Args *args, int i);

16  int main(int argc, char *argv[]){
   int i;
   char *version;
   Args *args;
   FILE *fp;

21  version = "0.13";
   setprogname2("new2view");
   args = getArgs(argc, argv);
   if(args->v)
26  printSplash(version);
   if(args->h || args->e)
   printUsage(version);
   if(args->numInputFiles == 0){
   fp = stdin;

```

```

31     scanFile(fp, args, 0);
} else {
    for (i=0; i<args->numInputFiles; i++) {
        fp = fopen(args->inputFiles[i], "r");
        scanFile(fp, args, i);
36     fclose(fp);
    }
}
free(args);
free(progname());
41 return 0;
}

void scanFile(FILE *fp, Args *args, int i) {
    Node *root;

46     setBisonFile(fp);
    while ((root = parseTree()) != NULL) {
        root->x = root->y = 0; /* avoid valgrind warning if > 1 tree analyzed
        */
        if (deg(root) == 2 && !args->u) {
51             args->r = 1;
            layoutRootedTree(root);
        } else if (deg(root) == 3 && !args->r) {
            args->u = 1;
            layoutUnrootedTree(root);
56         } else if (args->r) {
            layoutRootedTree(root);
        } else if (args->u) {
            layoutUnrootedTree(root);
        } else {
61             args->r = 1;
            layoutRootedTree(root);
        }
        printLatex(root, args);
    }
66 }

```

5 Change Log

- Version 0.1
 - First version that runs.
- Version 0.2: September 24, 2012
 - Fixed positioning of leaves by placing the y-coordinates in `rooted.setYcoords` in order.
- Version 0.3: September 25, 2012
 - Use `gv` instead of `display` to view the tree.
- Version 0.4: September 28, 2012
 - Fixed repeated scaling of rooted trees.

- Version 0.5: November 8, 2013
 - Included option for displaying tree with Image Magic instead of `ghostview (-i)`.
- Version 0.6: November 20, 2014
 - Included drawing of scale and the `-s` option for manipulating it.
 - Redefined regex for number on line 50 of `newick.l`
- Version 0.7: November 26, 2014
 - Adjusted grammar in `newick.y` to allow numbers as taxon names.
- Version 0.8: November 28, 2014
 - Adjusted placement of scale bar.
 - Adjusted dimensions of `pspicture`.
- Version 0.9: January 5, 2015
 - Removed e-notation from x/y-coordinates in \LaTeX code.
 - Replaced `pst-all` package by `pstricks` and `pst-node`, which reduces memory consumption and allows drawing of very large trees.
- Version 0.10: January 8, 2015
 - Better separation of nodes & edges if all nodes are labeled (`-l` option).
 - Cleaned up compiler options in `Makefile`.
 - Removed possible infinite loop when searching for scale.
- Version 0.11: June 22, 2017
 - Since v. 0.6, a segmentation fault was produced when drawing more than one tree. This is fixed now, by adding `'\0'` to the file name template in


```
latex.setupFileNameTemplate
```
 - When computing more than one tree, `valgrind` flagged up an uninitialized variable. Fixed.
- Version 0.12, June 26, 2017
 - Removed debugging statements left over from the last round of revisions.
- Version 0.13, May 8, 2019
 - Allowed inclusion of internal node labels denoted in square brackets.
 - Fixed `char/int` but in interface.
 - Removed the option for drawing with image magic (`-i`), as this was not working.