

R Functions for Tree Stem Cubature

About R4Mcubature

R4Mcubature (Version 0.5-5) is an R package designed to make easier and faster processing data from “tree rigourous cubature”. Tree rigorous cubature should be understood as the measuration of invividual tree stems and/or branches along their length, taking the stem/branch diameter outside bark and the stem/branch inside bark (optionally) at several fixed positions along the stem/branch length.

The package takes into account two types of crown shapes: excurrent and decurrent. For excurrent trees the basic unit for the measurement of the tree wood content (wood volume) is the stem, because branch wood content is considered negligible. For decurrent trees the branch is the basic unit for the measurement of the tree wood volume and it is assumed that one single stem might have multiples branches.

The packages has functions to perform the following operations:

- computation of the total volume of stems;
- interpolation of stem measures such as:
    - diameter at a given height/position of the stem, and
    - height/position at the stem for a given diameter.
- computation of merchantable volume as:
    - merchantable volume up to a given merchantable diameter of the stem,
    - merchantable volume up to a given merchantable height at the stem,
    - merchantable volume for wood use classes defined as combinations of a minimum log diameter and a log length.
- computation of ratio of the merchantable volume to the total volume of the stem.
- computation of form factor (empirical form factor) and form indices for the stem as a whole and for stem sections.

For decurrent trees data, some of the above computations can not be performed. The package also has some utility and plotting functions to help manage and analyse data from tree cubature.

Objective

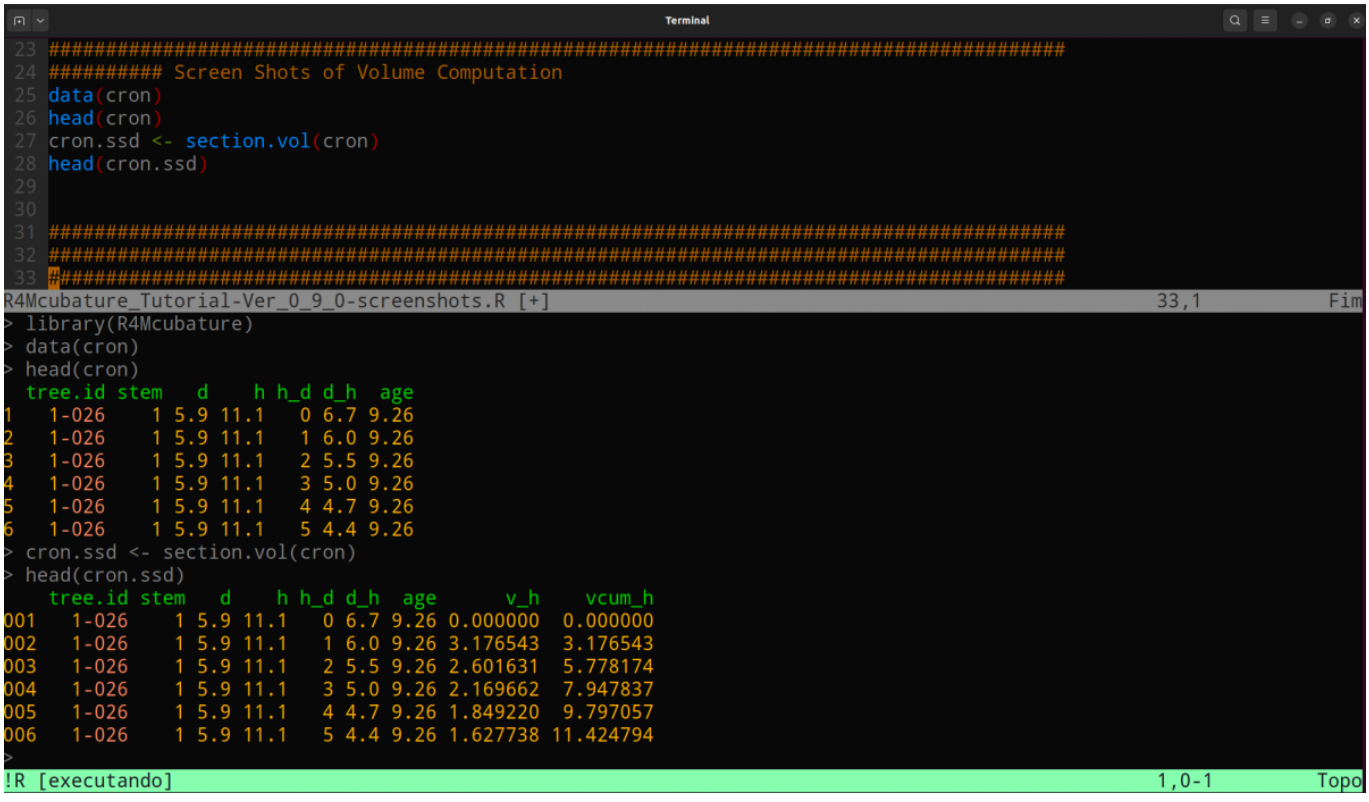
The objective of **R4Mcubature** is to make easy the computation of tree stem measurements in order to obtain data tables needed for the Forest Biometrics modelling of the trees. Particularly, the package's goal is to turn raw field measurements into proper data tables of

- any diameter and/or height along the stem;
- stem volume for given diameters and/or heights along the stem; and
- volume and number of logs for given combinations of log diameter-length.

Which are the basic data needed for fitting models of:

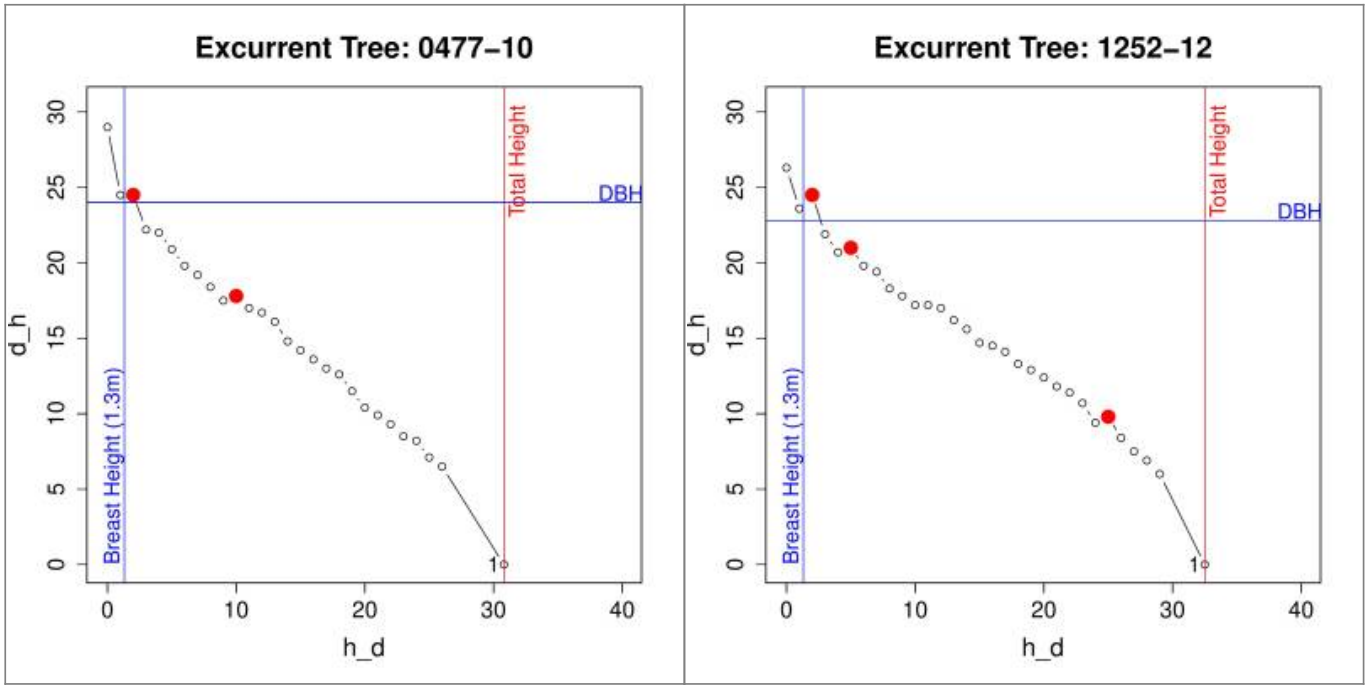
- volume equations (total and merchantable);
- taper equations; and
- merchantable volume ratio index equations.

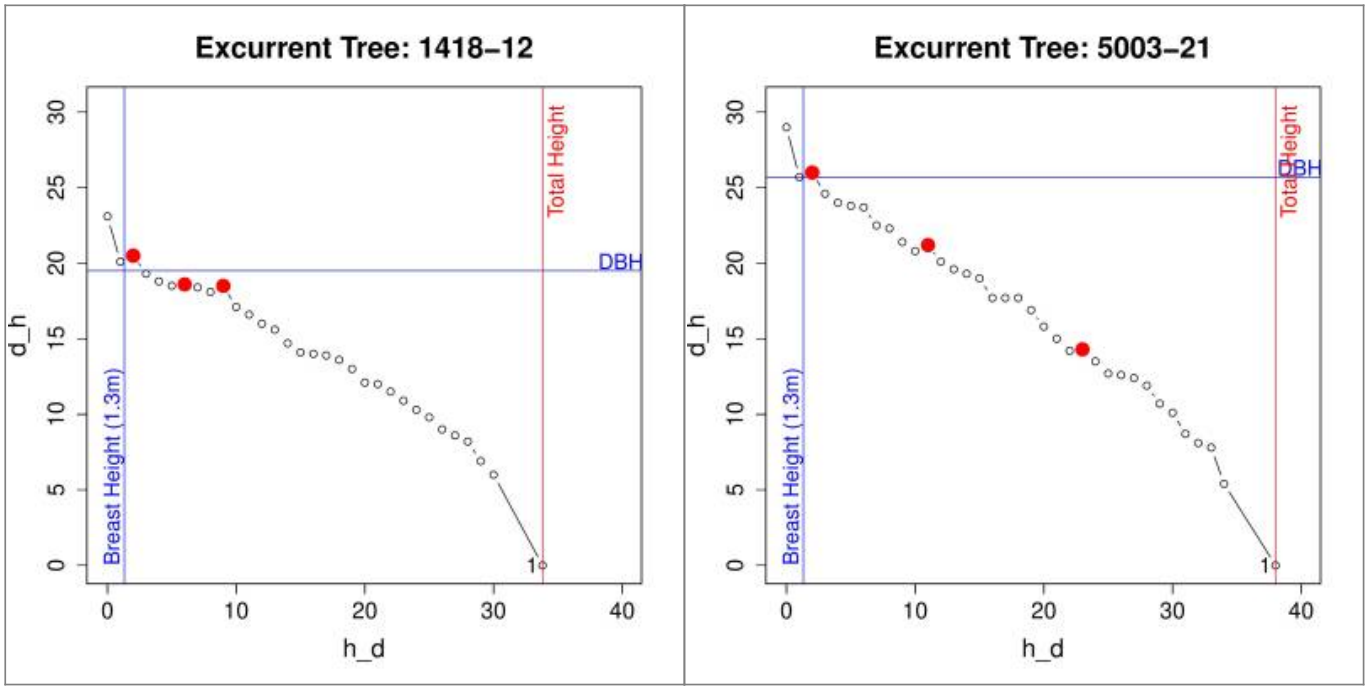
Screen Shots



```
Terminal
31 # Stem Volume Computation
32 data(flor)
33 flor.ssd <- section.vol(flor, inside=TRUE)
34 head(flor.ssd)
35 flor.vol <- stem.vol(flor.ssd, inside=TRUE)
36 head(flor.vol)
37
38 ##############################################################################
39 ##############################################################################
40 ##############################################################################
~
R4Mcubature_Tutorial-Ver_0_9_0-screenshots.R [+]                    40,1          Fim
> data(flor)
> flor.ssd <- section.vol(flor, inside=TRUE)
> head(flor.ssd)
    tree.id stem d    h h_d d_h di_h       forest       v_h       vi_h     vcum_h    vicum_h
001 01-0148    1 7 10.8 0.1 9.0  7.0 CACHOEIRA II 0.6391453 0.3866434  0.6391453  0.3866434
002 01-0148    1 7 10.8 0.3 9.0  7.2 CACHOEIRA II 1.2723450 0.7919955  1.9114903  1.1786389
003 01-0148    1 7 10.8 0.7 8.0  6.4 CACHOEIRA II 2.2776547 1.4576990  4.1891450  2.6363379
004 01-0148    1 7 10.8 1.3 7.0  6.0 CACHOEIRA II 2.6624998 1.8133273  6.8516448  4.4496652
005 01-0148    1 7 10.8 3.3 5.8  5.2 CACHOEIRA II 6.4905304 4.9511500 13.3421752  9.4008152
006 01-0148    1 7 10.8 5.3 5.1  4.7 CACHOEIRA II 4.6849000 3.8586612 18.0270752 13.2594764
> flor.vol <- stem.vol(flor.ssd, inside=TRUE)
> head(flor.vol)
   tree.id stem     v.tot    vi.tot
01 01-0148    1 22.763419 17.150732
02 01-0148    2 20.979752 16.052793
03 03-0315    1 21.669753 14.065858
04 03-0315    2 19.281005 13.524019
05 04-0401    1 10.742012  8.070936
06 04-0401    2  5.413207  3.967027
>
!R [executando]                                                    1,0-1         Topo
```

Example Plots





Download

R4Mcubature is provided under *GNU General Public License* in a **as-it-is basis**, with **NO support** and **NO service** included.

Download, install and use **at your own risk**:

- ***Package under development*** as a **.tar.gz** file.
- Tutorial PDF.

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