

Working Document for the Improvement to nls() GSOC project

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Abstract

nls() is the primary nonlinear modeling tool in base R. It has a great many features, but it is about two decades old and has a number of weaknesses, as well as some gaps in documentation. This document is an ongoing record of work under the Google Summer of Code 2021 of the first author. As such it is NOT meant to be a finished academic report, but a form of extended diary of activity, issues and results.

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By email, a Google Meet was set up for May 19 at noon Ottawa time. JN downloaded the latest version of `R-devel.tar.gz` and unpacked it into a directory `~/vmshare/R-devel` which is shared with a VirtualBox VM of Kubuntu 20.04 (Focal Fossa), a long-term support version of Linux. Opening a terminal inside this VM, it was possible to build and run this version of R.

```
cd /media/sf_vmshare/R-devel/  
./configure  
make  
sudo make install  
[admin password]  
R
```

This launched the development version of R correctly.

JN also set up this document.

Agenda for May 19

- check Meet is working
- introductions
- start linux VM install if an iso is available. May want to check that VirtualBox Guest additions is available and that the shared directory works, as these sometimes require some attention to permissions and ownership etc.
- Consider early goals to for possible nls() changes. See below.
- Set objectives for next two weeks
- Set next online meeting

Possible early goals

- Get a VM running under VirtualBox and install build tools. See <https://support.rstudio.com/hc/en-us/articles/218004217-Building-R-from-source> I did NOT need more than `./configure` in my build, as I am not building a server version.
- Try the build. (Cheer loudly when it works!)

- Explore and document the R source for nls-related code. In particular, we want
 - to list the files that have such code or calls to it
 - to note, if possible, what each does
 - to note, in particular, where `nls()` solves the Gauss-Newton equations, as we will want to modify these sections to augment them to allow a Marquardt stabilization.
 - to note, in particular, where `nls()` computes the Jacobian and/or Hessian for the nonlinear least squares problem. In package `nlsr`, there are tools that allow an expression for the model to be parsed and processed to compute the Jacobian using symbolic or automatic derivatives. This may or may not be feasible for `nls()`. However, we may be able to improve the approximation used.
- Augment this document to record what has been done and results or problems.
- Add to the bibliography file specified. This is taken from another work, but as Rmarkdown only uses the references it needs, it will serve as a template.
- AB can ask for pointers to references to add to this document or to subsidiary documents we will create as necessary to describe parts of the work if required.