

02-Programming

January 31, 2018

1 2. Shell and other kinds of programming

1.1 Shell programming: advanced parts of the bash tutorial

In [3]: %%bash

```
NAME[0]="Zara"
NAME[1]="Qadir"
NAME[2]="Mahnaz"
NAME[3]="Ayan"
NAME[4]="Daisy"
echo "First Method: ${NAME[*]}"
echo "Second Method: ${NAME[@]}"
```

First Method: Zara Qadir Mahnaz Ayan Daisy
Second Method: Zara Qadir Mahnaz Ayan Daisy

In [14]: %%file list.sh
#!/bin/sh

```
NAME[0]="Zara"
NAME[1]="Qadir"
NAME[2]="Mahnaz"
NAME[3]="Ayan"
NAME[4]="Daisy"
echo "First Method: ${NAME[*]}"
echo "Second Method: ${NAME[@]}"
```

Writing list.sh

In [15]: %%bash
chmod 755 list.sh
./list.sh

First Method: Zara Qadir Mahnaz Ayan Daisy
Second Method: Zara Qadir Mahnaz Ayan Daisy

```

In [28]: %%bash
echo "Hello, world!"

### These are all of the bash environment variables (LOTS OF LINES!):
#set

### These are the variables that have "TRIUMF" in their name:
set | grep TRIUMF

### Select a specific variable and parse the NAME=VALUE for VALUE:
set | grep TRIUMF_FONTS | cut -d= -f2

### instead of typing it, assign it to a variable:
FDIR=`set | grep TRIUMF_FONTS | cut -d= -f2`

echo "Fonts are in \"\$FDIR\", look there"

```

```

Hello, world!
TRIUMF_FONTS=/usr/local/lib
TRIUMF_PLOTTER_TYPE=PSA
TRIUMF_TERMINAL_TYPE=X
/usr/local/lib
Fonts are in "/usr/local/lib", look there

```

```

In [46]: %%bash
VARS=`set | grep TRIUMF`

for v in $VARS
do
    name=`echo $v | cut -d= -f1`
    value=`echo $v | cut -d= -f2`
    echo "Environment variable \"\$name\" has a value \"\$value\" "
done

```

```

Environment variable "TRIUMF_FONTS" has a value "/usr/local/lib"
Environment variable "TRIUMF_PLOTTER_TYPE" has a value "PSA"
Environment variable "TRIUMF_TERMINAL_TYPE" has a value "X"

```

```

In [44]: %%file hello.c
#include <stdio.h>
#include <math.h>

void main() {
    double f;

    f=sin(3.);
}

```

```
    printf("Hello, world!  sin(3)=%f\n",f);
}
```

Overwriting hello.c

```
In [45]: %%bash
        cc hello.c -lxxxx
        ./a.out
```

Hello, world! sin(3)=0.141120

1.2 Homework

Use bash commands `ar`, `nm`, `grep`, `find`, `cut`, and bash loops as needed to find which of the `*.a` or `*.so` files in `/usr/lib64` and/or in `/lib` and/or `/lib64` and all of their subdirectories contains a subroutine to calculate `arctan()`. Ignore symbolic link files, just use the actual library file, to remove duplication.

```
In [51]: %%file sol.sh
```

```
#!/bin/sh

# check input line for parameters, use the first
if [ $# == 0 ]
then
# at least one parameter is mandatory
  echo "  usage: sol.sh subroutine_name"
  exit
fi

# get here if at least one name was specified, use it

# if more than one, tell the user we are ignoring the extra input
if [ $# > 1 ]
then
# at least one parameter is mandatory
  echo "  warning: extra input \"$2 ...\" ignored"
fi

FILES=`find /usr/lib64 -name "*.a" -print`

for f in $FILES
do
#  echo "found: $f"
  ar -t $f | grep $1
done
```

```
FILES=`find /usr/lib64 -name "*.so.*" -print`
```

```
for f in $FILES
do
    result=`nm -D $f | grep "U $1"`
    if [ ! -z "$result" ]
    then
        echo "found $1 in: $f"
    fi
done
```

Overwriting sol.sh

```
In [50]: %%bash
        chmod 755 sol.sh
```

```
In [52]: %%bash
        ./sol.sh atan
```

```
warning: extra input " ..." ignored
found atan in: /usr/lib64/libicui18n.so.50
found atan in: /usr/lib64/libicui18n.so.50.1.2
found atan in: /usr/lib64/liblcms2.so.2
found atan in: /usr/lib64/liblcms2.so.2.0.6
found atan in: /usr/lib64/sane/libsane-fujitsu.so.1
found atan in: /usr/lib64/sane/libsane-fujitsu.so.1.0.24
found atan in: /usr/lib64/sane/libsane-genesys.so.1
found atan in: /usr/lib64/sane/libsane-genesys.so.1.0.24
found atan in: /usr/lib64/sane/libsane-canon_dr.so.1
found atan in: /usr/lib64/sane/libsane-canon_dr.so.1.0.24
found atan in: /usr/lib64/sane/libsane-kvs1025.so.1
found atan in: /usr/lib64/sane/libsane-kvs1025.so.1.0.24
found atan in: /usr/lib64/libexslt.so.0.8.17
found atan in: /usr/lib64/libvorbis.so.0
found atan in: /usr/lib64/libvorbis.so.0.4.6
found atan in: /usr/lib64/libexslt.so.0
found atan in: /usr/lib64/libpixmap-1.so.0
found atan in: /usr/lib64/libpixmap-1.so.0.34.0
found atan in: /usr/lib64/libgfortran.so.3.0.0
found atan in: /usr/lib64/libodfgen-0.1.so.1
found atan in: /usr/lib64/libodfgen-0.1.so.1.0.4
found atan in: /usr/lib64/libart_lgpl_2.so.2
found atan in: /usr/lib64/libart_lgpl_2.so.2.3.21
found atan in: /usr/lib64/libgfortran.so.3
found atan in: /usr/lib64/libspeexdsp.so.1
found atan in: /usr/lib64/libspeexdsp.so.1.5.0
found atan in: /usr/lib64/libopus.so.0.3.0
found atan in: /usr/lib64/atlas/libsatlas.so.3
```

found atan in: /usr/lib64/atlas/libsatlas.so.3.10
found atan in: /usr/lib64/atlas/libtatlas.so.3
found atan in: /usr/lib64/atlas/libtatlas.so.3.10
found atan in: /usr/lib64/libopus.so.0
found atan in: /usr/lib64/libIlmImf.so.7
found atan in: /usr/lib64/libIlmImf.so.7.0.0
found atan in: /usr/lib64/libgsl.so.0
found atan in: /usr/lib64/libgsl.so.0.16.0
found atan in: /usr/lib64/libslang.so.2
found atan in: /usr/lib64/libslang.so.2.2.4
found atan in: /usr/lib64/liblapack.so.3
found atan in: /usr/lib64/libcdr-0.1.so.1.0.1
found atan in: /usr/lib64/liblapack.so.3.4
found atan in: /usr/lib64/liblapack.so.3.4.2
found atan in: /usr/lib64/libmshpub-0.1.so.1
found atan in: /usr/lib64/libmshpub-0.1.so.1.0.2
found atan in: /usr/lib64/libcdr-0.1.so.1
found atan in: /usr/lib64/libfreehand-0.1.so.1
found atan in: /usr/lib64/libfreehand-0.1.so.1.0.1
found atan in: /usr/lib64/libpython2.7.so.1.0
found atan in: /usr/lib64/python2.7/site-packages/numpy/.libs/libgfortran-ed201abd.so.3.0.0
found atan in: /usr/lib64/python2.7/site-packages/scipy/.libs/libgfortran-ed201abd.so.3.0.0
found atan in: /usr/lib64/libply-splash-core.so.2
found atan in: /usr/lib64/libply-splash-core.so.2.1.0
found atan in: /usr/lib64/libgd.so.2
found atan in: /usr/lib64/libgd.so.2.0.0
found atan in: /usr/lib64/libwmf-0.2.so.7.1.0
found atan in: /usr/lib64/libspiro.so.0
found atan in: /usr/lib64/libsox.so.2
found atan in: /usr/lib64/libsox.so.2.0.1
found atan in: /usr/lib64/libtiff.so.5
found atan in: /usr/lib64/libtiff.so.5.2.0
found atan in: /usr/lib64/libspiro.so.0.0.1
found atan in: /usr/lib64/libpoppler.so.46
found atan in: /usr/lib64/libpoppler.so.46.0.0
found atan in: /usr/lib64/libgs.so.9
found atan in: /usr/lib64/libgs.so.9.07
found atan in: /usr/lib64/libfprint.so.0
found atan in: /usr/lib64/libfprint.so.0.0.0
found atan in: /usr/lib64/libwmf-0.2.so.7
found atan in: /usr/lib64/libpangocairo-1.0.so.0
found atan in: /usr/lib64/libpangoxft-1.0.so.0
found atan in: /usr/lib64/libpangoxft-1.0.so.0.4000.4
found atan in: /usr/lib64/libgtk-x11-2.0.so.0
found atan in: /usr/lib64/libgtk-x11-2.0.so.0.2400.31
found atan in: /usr/lib64/libpangocairo-1.0.so.0.4000.4
found atan in: /usr/lib64/libcogl.so.20
found atan in: /usr/lib64/libcogl.so.20.4.2

found atan in: /usr/lib64/librsvg-2.so.2
found atan in: /usr/lib64/librsvg-2.so.2.40.16
found atan in: /usr/lib64/libMagickCore.so.5
found atan in: /usr/lib64/libMagickCore.so.5.0.0
found atan in: /usr/lib64/libgnomecanvas-2.so.0
found atan in: /usr/lib64/libgnomecanvas-2.so.0.3000.3
found atan in: /usr/lib64/lib sane.so.1.0.24
found atan in: /usr/lib64/libfltk.so.1.3
found atan in: /usr/lib64/lib sane.so.1
found atan in: /usr/lib64/tracker-1.0/libtracker-data.so.0
found atan in: /usr/lib64/tracker-1.0/libtracker-data.so.0.0.0
found atan in: /usr/lib64/libxatracker.so.2
found atan in: /usr/lib64/libxatracker.so.2.3.0
found atan in: /usr/lib64/libgeocode-glib.so.0
found atan in: /usr/lib64/libgeocode-glib.so.0.0.0
found atan in: /usr/lib64/libgdk-3.so.0
found atan in: /usr/lib64/libgdk-3.so.0.2200.10
found atan in: /usr/lib64/libgtk-3.so.0
found atan in: /usr/lib64/libgtk-3.so.0.2200.10
found atan in: /usr/lib64/libclutter-1.0.so.0
found atan in: /usr/lib64/webkit2gtk-4.0/libicui18n.so.57
found atan in: /usr/lib64/webkit2gtk-4.0/libicui18n.so.57.1
found atan in: /usr/lib64/libjavascriptcoregtk-4.0.so.18
found atan in: /usr/lib64/libgweather-3.so.6
found atan in: /usr/lib64/libclutter-1.0.so.0.2600.0
found atan in: /usr/lib64/libclutter-glx-1.0.so.0
found atan in: /usr/lib64/libjavascriptcoregtk-4.0.so.18.4.14
found atan in: /usr/lib64/libwebkit2gtk-4.0.so.37
found atan in: /usr/lib64/libwebkit2gtk-4.0.so.37.14.14
found atan in: /usr/lib64/libgweather-3.so.6.5.1
found atan in: /usr/lib64/libchamplain-0.12.so.0
found atan in: /usr/lib64/libchamplain-0.12.so.0.9.1
found atan in: /usr/lib64/libgnomekbd.so.8
found atan in: /usr/lib64/libgnomekbd.so.8.0.0
found atan in: /usr/lib64/liba2ps.so.1.0.0
found atan in: /usr/lib64/liba2ps.so.1
found atan in: /usr/lib64/qt-3.3/lib/libqt-mt.so.3
found atan in: /usr/lib64/qt-3.3/lib/libqt-mt.so.3.3
found atan in: /usr/lib64/qt-3.3/lib/libqt-mt.so.3.3.8
found atan in: /usr/lib64/libjavascriptcoregtk-3.0.so.0
found atan in: /usr/lib64/libjavascriptcoregtk-3.0.so.0.16.19
found atan in: /usr/lib64/libwebkitgtk-3.0.so.0
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found atan in: /usr/lib64/libQtDeclarative.so.4
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found atan in: /usr/lib64/libQtDeclarative.so.4.8.5
found atan in: /usr/lib64/libQtGui.so.4
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found atan in: /usr/lib64/libQtSvg.so.4.8
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found atan in: /usr/lib64/libQtCore.so.4
found atan in: /usr/lib64/libQtSvg.so.4.8.5
found atan in: /usr/lib64/libQtCore.so.4.8
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found atan in: /usr/lib64/libQtScript.so.4
found atan in: /usr/lib64/libQtScript.so.4.8
found atan in: /usr/lib64/libQtScript.so.4.8.5
found atan in: /usr/lib64/libmp3lame.so.0
found atan in: /usr/lib64/libmp3lame.so.0.0.0
found atan in: /usr/lib64/libavutil.so.54
found atan in: /usr/lib64/libavutil.so.54.31.100
found atan in: /usr/lib64/libschroedinger-1.0.so.0
found atan in: /usr/lib64/libschroedinger-1.0.so.0.11.0
found atan in: /usr/lib64/libopenal.so.1
found atan in: /usr/lib64/libopenal.so.1.16.0
found atan in: /usr/lib64/libtwolame.so.0
found atan in: /usr/lib64/libtwolame.so.0.0.0
found atan in: /usr/lib64/libsoxr.so.0
found atan in: /usr/lib64/libwx_gtk2u_core-2.8.so.0
found atan in: /usr/lib64/libsoxr.so.0.1.1
found atan in: /usr/lib64/libavcodec.so.56
found atan in: /usr/lib64/libavcodec.so.56.60.100
found atan in: /usr/lib64/libavfilter.so.5
found atan in: /usr/lib64/libavfilter.so.5.40.101
found atan in: /usr/lib64/libwx_gtk2u_ogl-2.8.so.0
found atan in: /usr/lib64/libwx_gtk2u_ogl-2.8.so.0.8.0
found atan in: /usr/lib64/libwx_gtk2u_core-2.8.so.0.8.0
found atan in: /usr/lib64/libwx_gtk2u_svg-2.8.so.0
found atan in: /usr/lib64/libwx_gtk2u_svg-2.8.so.0.8.0
found atan in: /usr/lib64/libruby.so.2.0
found atan in: /usr/lib64/libruby.so.2.0.0
found atan in: /usr/lib64/libkhtml.so.5
found atan in: /usr/lib64/libkhtml.so.5.14.8
found atan in: /usr/lib64/libkjs.so.4
found atan in: /usr/lib64/libkjs.so.4.14.8
found atan in: /usr/lib64/libpoppler.so.37
found atan in: /usr/lib64/libpoppler.so.37.0.0
found atan in: /usr/lib64/libQt5Gui.so.5.6
found atan in: /usr/lib64/libQt5Gui.so.5
found atan in: /usr/lib64/libQt5Gui.so.5.6.2
found atan in: /usr/lib64/libQt5Widgets.so.5.6.2
found atan in: /usr/lib64/libQt5Widgets.so.5
found atan in: /usr/lib64/libQt5Widgets.so.5.6
found atan in: /usr/lib64/libQt5Core.so.5
found atan in: /usr/lib64/libQt5Core.so.5.6

found atan in: /usr/lib64/libQt5Core.so.5.6.2
found atan in: /usr/lib64/libGraphicsMagick-Q16.so.3
found atan in: /usr/lib64/libGraphicsMagick-Q16.so.3.16.0
found atan in: /usr/lib64/octave/3.8.2/liboctave.so.2
found atan in: /usr/lib64/octave/3.8.2/liboctave.so.2.0.0
found atan in: /usr/lib64/octave/3.8.2/liboctinterp.so.2
found atan in: /usr/lib64/octave/3.8.2/liboctinterp.so.2.0.0
found atan in: /usr/lib64/libglpk.so.36
found atan in: /usr/lib64/libglpk.so.36.0.1

ar: /usr/lib64/libieee.a: File format not recognized
ar: /usr/lib64/libmcheck.a: File format not recognized
ar: /usr/lib64/libQtUiTools_debug.a: File format not recognized
nm: /usr/lib64/.libgcrypt.so.11.hmac: File format not recognized
nm: /usr/lib64/fipscheck/libgmp.so.10.2.0.hmac: File format not recognized
nm: /usr/lib64/fipscheck/libgmp.so.10.hmac: File format not recognized
nm: /usr/lib64/fipscheck/libfipscheck.so.1.2.1.hmac: File format not recognized
nm: /usr/lib64/fipscheck/libfipscheck.so.1.hmac: File format not recognized
nm: /usr/lib64/.libhogweed.so.2.5.hmac: File format not recognized
nm: /usr/lib64/.libhogweed.so.2.hmac: File format not recognized
nm: /usr/lib64/.libnettle.so.4.7.hmac: File format not recognized
nm: /usr/lib64/.libnettle.so.4.hmac: File format not recognized
nm: /usr/lib64/.libcrypto.so.10.hmac: File format not recognized
nm: /usr/lib64/.libssl.so.1.0.2k.hmac: File format not recognized
nm: /usr/lib64/.libssl.so.10.hmac: File format not recognized
nm: /usr/lib64/.libcrypto.so.1.0.2k.hmac: File format not recognized
nm: /usr/lib64/.libgnutls.so.28.43.0.hmac: File format not recognized
nm: /usr/lib64/.libgnutls.so.28.hmac: File format not recognized