

Routh v 2.0

By Andrea Baccin, November 14 2002

Disclaimer & Copyright

This program is freeware, so no registration or licensing fees are necessary. You are free to distribute this program to anyone, as long as this document is included.

I cannot take responsibility for any damage or data loss caused by this program since it is written in 100% SysRPL and there could be bugs in it. If you have any suggestions, additions or find any bugs in the code, you're welcome to contact me per email baccin.andrea@libero.it.

Requirements & Installation

You need to copy the library (library #1329) to the calculator (with you preferred com program) and store it in a port (any port should do). No other particular programs are needed. Once you have the library in the stack type `:x: 1329 STO` , where *x* is the port you want to store the library (0,1,2)

Working with Routh

Routh is a library for building routh's tables. This tables are useful mainly in analysis and system control applications for finding if a system is stable or not.

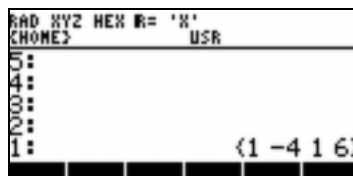
The library have only one command : Routh. This command applies the Routh criterion to the polynomial given on the stack at level 1, entered as a coefficient list.

The library handle all special cases: a line starting with n zeros and a line of zeros.

Note that you can scroll the display with the arrow keys, and you can go to top/bottom of the display using RSHIFT – Arrow.

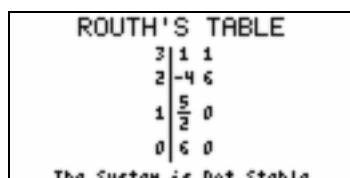
Examples

Enter the coefficient list { 1 -4 1 6 }



Calculator screen showing the coefficient list { 1 -4 1 6 } entered at level 1 of the stack. The screen displays the stack levels 0 through 5, with level 1 containing the list (1 -4 1 6).

Type Routh or access it via menus. You will get



Calculator screen showing Routh's Table for the polynomial 1s³ - 4s² + 1s + 6. The table is displayed as follows:

ROUTH'S TABLE		
3	1	1
2	-4	6
1	5	0
0	6	0

The System is Not Stable

Let's try one with a line beginning with a 0 : { 1 0 3 -2 }

```
RAD XYZ HEX R= 'H'
CHOME3          USR
5:
4:
3:
2:
1:              {1 0 3 -2}
Routh>About| | | |
```

The result is:

ROUTH'S TABLE			
3	1	3	
2.1	2	0	
2.2	0	-2	
2	2	-2	
1	4	0	
0	-2	0	
The System is Not Stable			

Now one with a line of zeros { 1 1 -2 -3 -7 -4 -4 }

```
RAD XYZ HEX R= 'H'
CHOME3          USR
5:
4:
3:
2:
1:              {1 1 -2 -3 -7 -4 -4}
Routh>About| | | |
```

The result is:

ROUTH'S TABLE				
6	1	-2	-7	-4
5	1	-3	-4	0
4	1	-3	-4	0
3.1	0	0	0	0
3	4	-6	0	0
2	$\frac{-3}{2}$	-4	0	0
1	$\frac{-50}{3}$	0	0	0
0	-4	0	0	0
The System is Not Stable				

This one have both cases : $\{ 1 \ 1 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 1 \}$

```

RAD XYZ HEX R= 'R'
[HOME]          USB
5:
4:
3:
2:
1:          { 1 1 1 1 0 0 1 0 1 }
Routh>About|

```

The result is:

ROUTH'S TABLE				
8	1	1	0	1 1
7	1	1	0	0 0
6.2	0	0	1	1 0
6.1	1	1	0	0 0
6	1	1	1	1 0
5.2	0	-1	-1	0 0
5.1	1	1	0	0 0
5	1	0	-1	0 0
4	1	2	1	0 0
3	-2	-2	0	0 0
2	1	1	0	0 0
1.1	0	0	0	0 0
1	2	0	0	0 0
0	1	0	0	0 0

The System is Not Stable

Routh Library handle variables coefficients: $\{ 1 \ 6 \ 11 \ 6 \ 'k+2' \}$

```

RAD XYZ HEX R= 'R'
[HOME]          USB
5:
4:
3:
2:
1:          { 1 6 11 6 K+2 }
Routh>About|

```

The result is:

ROUTH'S TABLE				
4	1	11	K+2	
3	6	6	0	
2	10	K+2	0	
1	$-\frac{2K-24}{5}$	0	0	
0	K+2	0	0	

The System is Stable for
 $K+2 > 0$
 $-\frac{2K-24}{5} > 0$

Note that the program returns the stability conditions.

These examples are all from the book "Controlli Automatici" G.Marro

Credits

I would like to thank Carsten Dominik and Peter F. Geelhoed for developing Emacs, Prof. Wolfgang Rautenberg for OT49 & keyman, Eduardo M Kalinowski and Carsten Dominik for the wonderful "Programming in System RPL", William Graves for improving Debug2, the best developing tool for this platform, and finally Gustavo Portales for helping me with very useful hints.

And of course ACO for building such a great machine.

History

V1.0: First Release

V1.1: Bug fixes, fancy output, better performance

(all the program now is in System RPL), now sorting is with Fast ESF Sort.

V2.0Beta: Ported to Debug4x, a lot speed improvements, added progress bar, added stability conditions in results, no more use of Fast ESF Sort (but more fast, since was changed all the graphics engine), results centered in the screen, reduced memory usage (now only 4 nullams), reduced lib size.

V2.0 : bug fixes and reduced lib size (Thanks to Gustavo Portales)

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