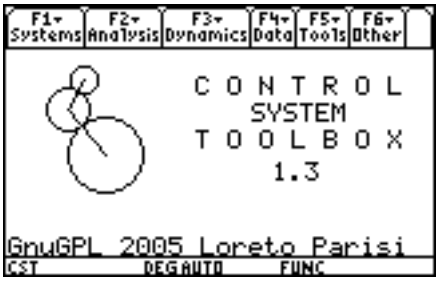
Control SystemToolbox

for TI-89



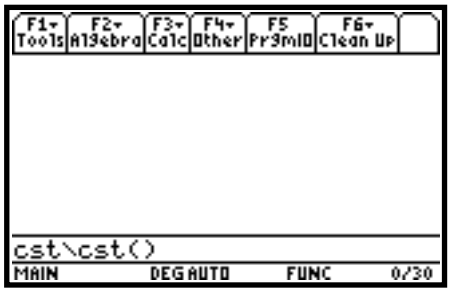
release 1.3

The CST Start Guide

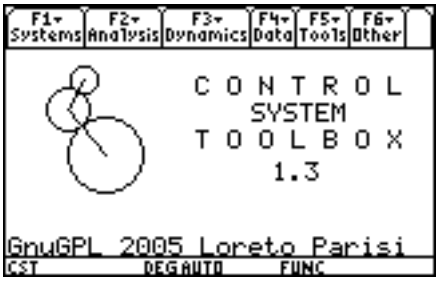
First Edtion October 2005

About Control System Toolbox *for TI-89*

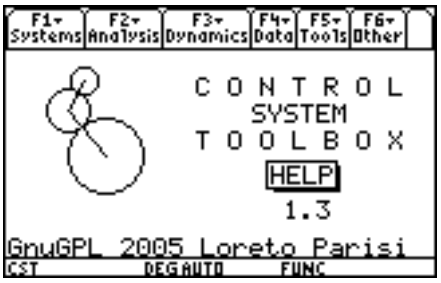
Control System Toolbox (CST) for TI-89 is a suite of specialized functions and programs for Systems Control and Tuning created by *Loreto Parisi* from June 2002 for the TI-89 personal calculator.



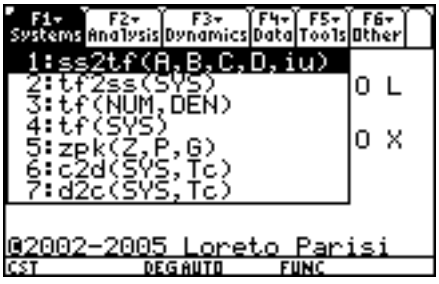
After installing (see *How To Install* on page 10), to run the program on your calculator, types *CST/cst()* from folder *MAIN* and wait few seconds.



This is the main screen of *cst()*. You can see several menus, in which you can find all the function you need to work with state space, linear and non – linear models, etc., grouped in a logical order.



If you have trouble to use any function, you can choose *help()* from *Other* menu (*F6*), to run the useful on- line help tool, which can be used instead of this reference guide to obtain instant help. Note that this is a standalone program so you can recall it typing *CST/help()* from *HOME*.



To recall menus you can use *Function-keys* instead of arrow keys. Then to choose a function, simply select it typing the number or the letter on the left, or use the arrow keys to navigate in the menu.

Disclaimer

The Open Source Philosophy

If you have an apple and I have an apple and we exchange apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.

This is our way of thinkin'...

How To Get Help

- *Consult the new CST Guides:*
  The **CST Start Guide** will guide you through the installation of CST.
  This guide is bundled with CST r1.3.

  The **CST Reference Guide** will guide you through all CST functions.
  Download this guide separately from CST Home.

  The **CST User Guide** will guide you using CST with complete examples.
  Download this guide separately from CST Home.

  Get the new CST Guides here:
  http://www.webalice.it/loretoparisi/downloads.html

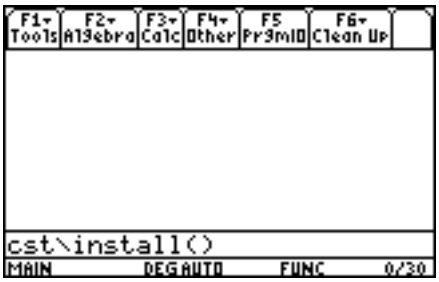
- *Get In Touch:*
  To get more help about CST *for TI-89* and/or to send comments, questions and suggestions, you can contact me at

  Loreto Parisi
  Email: loreto_parisi@yahoo.it
  CST Home: http://www.webalice.it/loretoparisi/

- *Send Feedback:*
  http://www.webalice.it/loretoparisi/feedback.html

How To Install

Use your linking software to send the program *CSTxxx.89G* on the calculator. All the files are automatically placed in the folder CST. Once installation has occurred, do not move, delete, or rename any of the functions and programs or pictures in the folder CST. All files included in folder CST are necessary to *cst()* to work right. For a list of files included in this folder, see *Contents*. For further notice please see **Note**.

Install CST	
	Once sent CST to your device, please run *cst\install()* from HOME.
	CST Install Tool starts. Please confirm pressing Enter now.
	The first step is to executing once all functions to improve performances. Please press Enter.
	Please wait while executing once all functions. This will take few minutes. The progress bar indicates the Install Tool is working. *Please don't break execution during this time.*

	The second step is to archive all executed functions. Please press Enter.
	Please wait while archiving all functions This will take few minutes. The progress bar indicates the Install Tool is working. *Please don't break execution during this time.*
	Now it's time to execute once and archive the programs. Press Enter will run the program. Then simply quit. Choose Enter to run *bodex()*, then press F1→ 1 to exit.
	Choose Enter to run *gstep()*, then press F7 to exit.
	Choose Enter to run *feedback()*, then press F4→ 1 to exit.

	Choose Enter to run *nyquist()*, then press F4 to exit.
	Choose Enter to run *rlocus()*, then press F5 to exit.
	This will execute and install the Error Management System, *error()*.
	The Error Management System was installed.
	Choose Enter to run *cst()*, then press F6 → 7 to exit.

	Choose Enter to run *cst()*, then press F6 → 7 to exit.
	Congratulations! Control System Toolbox *for TI-89* installation successed. To run *cst()* just now, choose Yes and press Enter. Enjoy the journey!

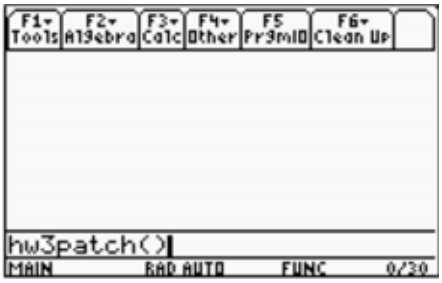
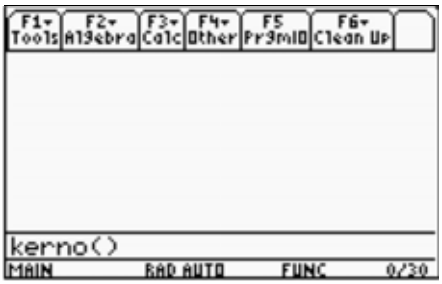
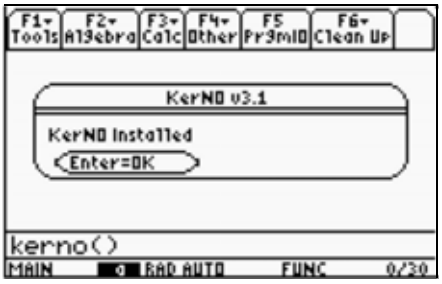
Note.

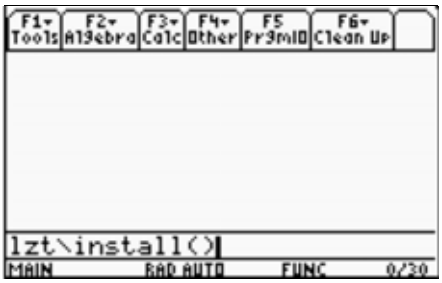
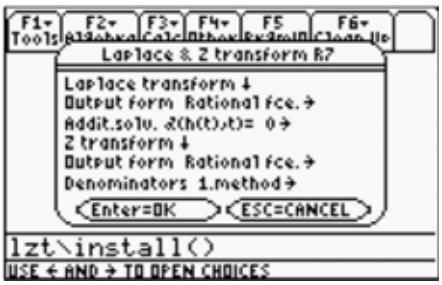
From release 1.3, CST needs the tool LZT to perform symbolic calculations (i.e. Laplace and Zeta transforms). To install LZT please follow instructions we provide in the following section **Install LZT**. We also raccomend to read the LZT readme file.

LZT r7
Author: Jiri Bazant
Email: georger@razdva.cz
Home: http://www.razdva.cz/georger/

This powerful tool needs any kernel like DoorsOS, UniOS or KerNO. We provide KenNO r3.1 from CST r1.3 as its convenient installation. To install KerNO please follow instructions we provide in the following section **Install KerNO**. We also raccomend to read the KerNo readme file.

KerNO r3.1
Author: Greg Dietsche
E-Mail: calc@gregd.org
Home: http://calc.gregd.org/

Install KerNO	
	First, we have to install the hw3patch(), for Hardware Version up to 3. Transfer the patch to TI-89, then run it from *main*.
	HW3Patch 1.00 Author: Kevin Kofler Copyright (C) 2004 Kevin Kofler. All rights reserved. Home: http://tigcc.ticalc.org.
	Now, we can install the kernel. Transfer KerNo to TI-89, then simply run it from *main*.
	KerNO is now installed in TI-89 memory.
	KerNO r3.1 Author: Greg Dietsche E-Mail: calc@gregd.org Home: http://calc.gregd.org/

Install LZT	
	After installing a kernel, we can install LZT release 7 (current).
	Send *lztR7.89g* to TI-89 and run *install* from *lzt* folder.
	Choose output options for Laplace and Zeta transforms: We will use 0 as derivative of the Heavside's Step and rational fce as output forms.
	Now we will choose Archive to improve performances of *lzt* and to save space in RAM memory, archiving *lzt* in Flash ROM memory.
	LZT r7 Author: Jiri Bazant Email: georger@razdva.cz Home: http://www.razdva.cz/georger/

Current Release

- *Control System Toolbox for TI-89*
  Current release: 1.3 October 2005
  Supported Calculator: TI-89 Hardware Version >2.00
  Supported OS: AMS >2.09
  New Features:
    - Symultaneous Continuous and Discrete Time Domain Analysis
    - Time Delay
    - Time Delay's Padè Approximation
    - Phase and Magnitude Margins
    - Routh Criterion and Conditions
    - Backward Eulero, Forward Eulero, Hold Equivalence Discretization
    - Nyquist Diagrams
    - Root Locus
    - Direct and Inverse Laplace Transformations
    - Direct and Inverse Zeta Transformations
    - Feedback Control Systems featuring
    - Design
        - P, PI, PD, PID Controllers
        - Lead, Lag, Lead-Lag Networks
        - Inputs and Noises
    - Analisys
        - Phase and Magnitude Margins
        - Network Transfer Functions
        - Time Domain Outputs
    - Tuning
        - Automatic Tuning featuring
            - Closed Loop Ziegler-Nichols
            - Open Loop Ziegler-Nichols
            - Optimal Control
        - Adaptive Filtering
        - Smith's Predictive Control

- *The CST Start Guide*
  Current version: 1st edition, October 2005
  Distribuition: Portable Document Format

- *The CST Reference Guide*
  Current version: 1st edition, October 2005
  Distribuition: Portable Document Format

- *The CST User Guide*
  Current version: 5th edition, October 2005
  Distribuition: Portable Document Format

Contents

Here are all functions, programs and other objects contained in *cst* folder.

Name	Description	Type
azeros()		Func
band()		Func
Bandn()		Func
Bandsub()		Func
Bodex()		Prgm
c2d()		Func
Check()		Func
Cpoles()		Func
Cst()		Prgm
Cstpi_		Mat
Cstpid_		Mat
Cstver_		Expr
D2c()		Func
Damp()		Func
Db()		Func
Dcgain()		Func
Degroot()		Func
Degzero()		Func
Eigenv()		Func
Error()		Prgm
Feedback()		Prgm
Gain()		Func
Gettd()		Func
Gstep()		Prgm
Help()		Prgm
Install()		Prgm
Linmod()		Func
Linspace()		Func
Logspace()		Func
Mag()		Func
Mag1()		Func
Magz()		Func
Margin()		Func
Nyquist()		Prgm
Pade()		Func
Peak()		Func
Phase()		Func
Phase1()		Func
Phasez()		Func
Poly()		Func
Poly2cof()		Func
Polydeg()		Func
Polyz2s()		Func
Pstep()		Func

Name	Description	Type
Pzmap()		Func
Rlocdata()		Func
Rloceval()		Func
Rlocus()		Prgm
Roots()		Func
Routh()		Func
Routhc()		Func
Rts2poly()		Func
Sampler()		Func
Spectre()		Func
Splash		Pic
Splhlp		Pic
Ss2tf()		Func
Step()		Func
Tconst()		Func
Tf()		Func
Tf2nd()		Func
Tf2ss()		func
Tmmax()		Func
Trim()		Func
Zoomfit2()		Prgm
Zpk()		Func
Zpkdata()		Func

Removing or modifying one of the objects above could result *cst* to don't work. Remember that *cst*, and all its contents are released under Gnu Public Licence.

Thanks to…

Many thanks to all those programmers which directly or indirectly gave a hand in making *CST for TI-89*.

The programmers

- *92BROTHERS*
  Contribute: *bodex()*
  E-mail: 92brothers@infinito.it
  Home: http://www.92brothers.net/
- *Francesco Orabona*
  Contribute: *logspace(), poly2cof(), zpk(), nyquist(), rlocus()*
  E-mail: bremen79@infinito.it
  Homepage: http://web.genie.it/utenti/b/bremen79/
- *Lars Frederiksen*
  Contribute: *DiffEq()*
  E-mail: ltf@post8.tele.dk
- *Greg Dietsche*
  Contribute: kerno()
  E-Mail: calc@gregd.org
  Home: http://calc.gregd.org/
- *Kevin Kofler*
  Contribute: hw3patch()
  Home: http://tigcc.ticalc.org.
- *Jiri Bazant*
  Contribute: *lzt()*
  E-mail: georger@razdva.cz
  Home: http://www.razdva.cz/georger/

The Beta Testers

- *Emidio Giordano*, Rome, Italy.

The Users

- *Miroslav Mihalj*
- *John Franklin*
- *Owen Fredericks*
- *Ricardo Vargas*
- *Edgar Salinas*
- *Scott Rogers*
- *James Chizen*
- *Matteo Melotti*
- *Many others…*

And to all those ones who help CST to grow up better and faster!