



Scilab/Scicos Code Generator for Flex

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Scilab/Scicos overview Code Generator Flex Version











What is Scicos?



is a scientific software package for numerical computations providing a powerful open computing environment for engineering and scientific applications.

> is OS independent: * Windows (*including Vista*) * Unix, Linux, * Mac OSX * ... your custom O.S. ©

is hardware platform independent.

is an open source software. Since 1994 it has been distributed freely along with the source code via the Internet. It is currently used in educational and industrial environments around the world. is now the responsibility of the Scilab Consortium, launched in May 2003.



A number of toolboxes are available with the system:

* 2-D and 3-D graphics * Linear algebra * sparse matrices * Polynomials * Rational functions * Interpolation * approximation * Simulation: **ODE** solver and **DAE** solver * Scicos: a hybrid dynamic systems modeller and simulator * Classic and robust control, LMI opt. * Signal processing



Scicos is ...



Scicos is a graphical dynamical system simulator toolbox built in



Scicos is used for signal processing, control systems, queuing systems, and to study physical and biological systems.

New extensions allow generation of component based physical modelling of electrical and hydraulic circuits using the Modelica language. With Scicos you can create block diagrams to model and simulate the dynamics of hybrid systems, control real system in real time with Scicos Hardware In the Loop (Scicos-HIL) and compile your models into executable code for faster simulation and <u>stand alone embedded</u> applications.

With Scicos you can:

Graphically model, compile, and simulate dynamical systems * Combine continuous and discrete-time behaviours in the

- same model
- * Select model elements from Palettes of standard blocks * Program new blocks in C, Fortran, or Scilab Language
- * Run simulations in batch mode from Scilab environment
- * Generate C code from Scicos model using a Code Generator
- * Run simulations in real time with real devices using Scicos-HIL
- * Generate hard real-time control executables with Scicos-RTAI

* Simulate digital communications systems with Scicos-ModNum

* Use implicit blocks developed in the Modelica language

Scilab: technology roadmap

> Objectives (2008 – 2011):

Planned major technical developments:

- > Graphics, Scilab GUI and GUI builder
- Scicos industrialization (GUI, quality,...)
- Documentation
- > New kernel, 64 bits and 128 bits technology
- > Improvement and updating of algorithms: control, signal processing, identification,...

Excellence domains:

- > Interoperability (with standard scientific software) and services architecture
- > HPC (High Performance Computing), Grid Computing, parallel computing, multi-core
- > C code generation, embedded systems
- > R & D: developments in collaboration with research

> Scilab 5.0 (2008):

- New license: CeCILL (GPL2 compatible) and GPL2.
- Modularization
- New and graphics rendering GUI





What do you need for your embedded RT applications?



Better tools

Access to source code and development chain

>High quality, flexibility, market superiority

- Knowledge
- Collaboration
- Independence

Cheaper

Faster

Better

➤Competitive

- No patent
- No royalties
- No hidden costs
- Protected by OS licenses



For modeling and Simulation

- Scilab: Scilab language (script)
- Scilab: integration with other programming languages (C/C++, Java, FORTRAN, etc.)
- Scicos: Scicos diagram (visual programming)
- Scicos: integration with other simulation platform (Modelica, GHDL, etc)

But also for embedded applications

Real Time simulation with Real plants

Scicos Hardware In the Loop

Scicos-HIL: the Scicos simulator executes the control section in real time and uses data acquisition cards for the connection with the real plant

≻Code Generation from Scicos diagram

- Scicos internal GP code generator
- Scicos-RTAI: for Linux RTAI systems
- Scicos-FLEX: for micro controllers and DSPs

Code Generation with Scilab/Scicos





Code Generator



- It converts a Scicos superblock into a dsPIC application ready to be executed by the MCU.
- > It supports single-rate single-task controller.
 - One and only one source of time is required.





A set of palette for the specific Hardware has been produced.

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Code Execution - Time

- The Scicos superblock is mapped to an Erika periodic task.
- The task is executed with a period which is equal to the Scicos Timesource period.
 - Some tricks are needed in order to improve performances.





To each block is connected a function

- Init, InOut or Close depending on the system status
- The application is executed block by block (function by function) following the "data path"





Some parameters are required by the generation engine.





Questions









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