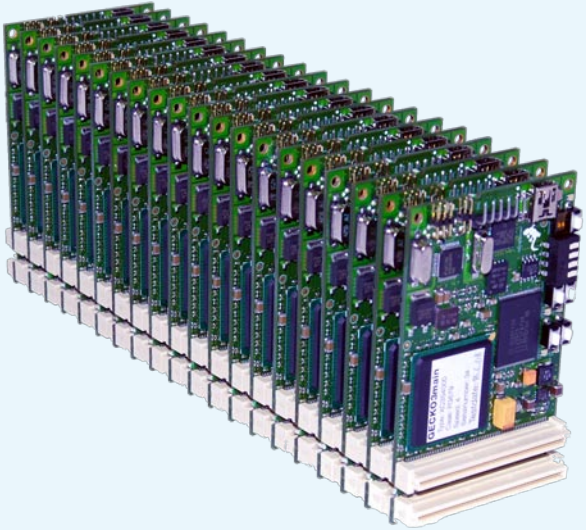
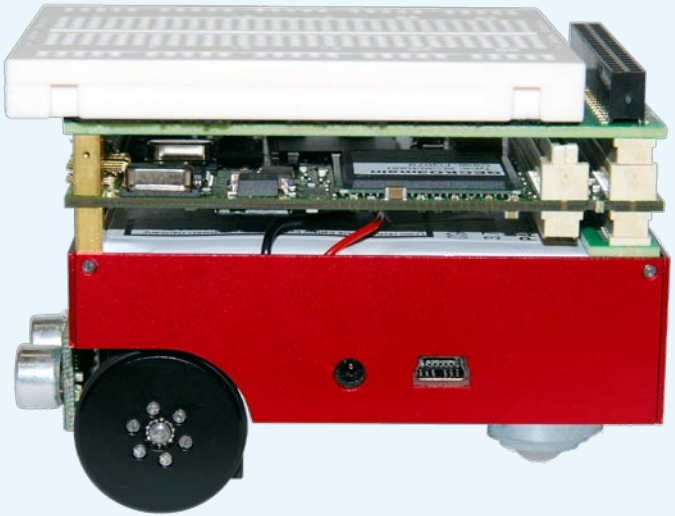
GECKO3

System-on-Chip Co-Design Environment

Bern University of Applied Sciences
MicroLab

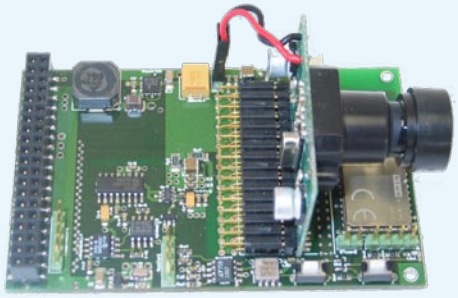




The GECKO system is a general purpose hardware/software co-design environment for real-time information processing and/or system-on-chip (SoC) solutions. The GECKO system supports a new design methodology for system-on-chips, which necessitates co-design of software, fast hardware and dedicated real-time signal processing hardware.

GECKO3 Modules

The GECKO system comprises hardware modules that can be readily interfaced. The GECKO3main module is the main experimental platform, offering the necessary computing power for processing intensive real-time algorithms as well as the necessary flexibility for control intensive software tasks.



For autonomous robots, various sensor capabilities are crucial. The GECKO3sensors board therefore houses a variety of sensors like a two-dimensional magnetic field sensor for compass application, a two-dimensional acceleration sensor, digital video camera for image processing as well as a bluetooth wireless communication device.

Different GECKO3 modules are available to adapt the GECKO3main to the needs of different applications. An optional board, the GECKO3interface, houses a 160 x 128 pixel graphical color OLED display and a keyboard.

The autonomous GECKO3EDU robot is a composition of different modules with sensors, motors and mechanical housing. It is used for educational purposes. One of its modules, the GECKO3power board, provides the necessary power supply and, in addition, houses H-bridges to control the robot's motors, on-board ultrasonic sensor for measuring distances to obstacles and line sensors for line-follower applications. The GECKO3 robot is the mechanical vehicle for the robot with 2 or 4 small motors and a 3900 mAh Li-Ion battery pack.

To support autonomous navigation in outdoor environments, the robots can use the GECKO3gps module to quickly add a high sensitivity GPS receiver with an on-board antenna. The module is GALILEO aware.

Extensibility, Scalability

The GECKO3main includes fully populated GECKO3 system bus connectors. The module can be stacked with any other GECKO3 module and also with other GECKO3main modules.

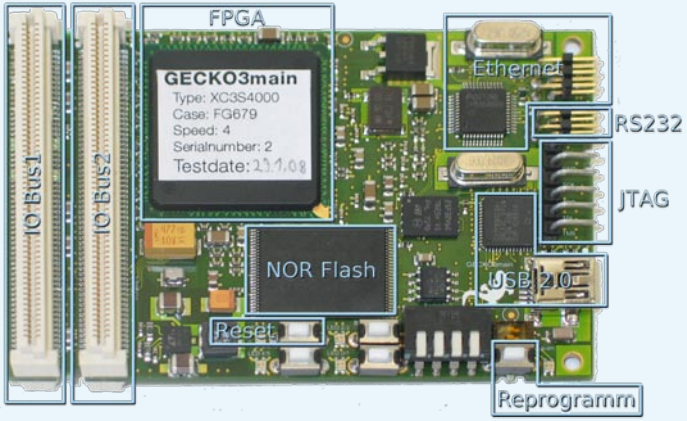
We provide a fast and collision free development environment because none of the I/O Pins on the System Bus are shared with on-board peripherals.

GECKO3main Module

The GECKO3main can be used as a general purpose system-on-chip platform for hardware/software co-designs.

The features include:

- Xilinx Spartan3 FPGA with 4Mio. gates
- 128 Mbyte DDR SDRAM and 32 Mbyte NOR Flash (Enough to support Linux)
- USB 2.0 High-Speed interface
- 100 Mbit/s Ethernet interface (Auto-MDIX)
- 193 non-shared I/O Pins
- Credit card size form factor (85mm x 54,5mm)
- Scalability
- Fully Compatible with IP-Cores from Opencores.org, LEON3 and Xilinx EDK

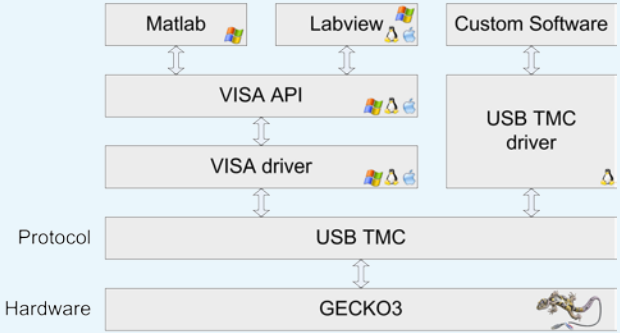


USB 2.0 Communication and FPGA Configuration

Matlab and Labview can access the GECKO3main through the VISA API (Virtual Instrument Software Architecture) using the Instrument Control Toolbox in Matlab. The VISA API can also be used from other environments calling Windows DLLs.

On Linux you can use normal file I/O with the USB-TMC driver instead of the proprietary VISA driver. The USBTMC Driver is included in every Linux Kernel >2.6.28, and you can also compile it yourself for older kernels.

We use this system not only to configure the FPGA during development and for data communication, but also to configure the FPGA in stand-alone mode.



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Documentation

All documentation, development files and tutorials are freely available on our Wiki. Please create an account, add your GECKO compatible projects and work with us to improve it:

http://labs.ti.bfh.ch/gecko/

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