Embedded Software for Digital Camera Based on PC104

Completed project - November 2005

Customer

Joint German-Belarusian venture "Proscan Special Instruments" develops devices for industries, scientific researches, laboratory diagnostics and medicine.

Objective

The task is to develop embedded software for operating internal equipment of HS 301 camera and to implement remote control via Ethernet-interface.

The development of software for control card is necessary to create visualization system and register low luminous fluxes received from spectral equipment.

Cameras are designed to receive high-quality images from solar-cell matrix (2048x2048 pixels) in the wave-length range from 400 to 1000 nm. They can be used as part of optical and electronic microscopes or as registration system in spectral devices of various purposes.

Solution

Alongside with optimization of embedded Linux distribution for PC104 Advantech PC-3350 (RAM 64Mb, Flash 64Mb) hardware platform, our team developed software that has the following functions:

- Initialization and testing of equipment when switching HS301 camera;
- Continuous monitoring of equipment status;
- Connection to external computer via Ethernet-interface;
- Reception of commands from external computer via dedicated protocol and their execution;
- Setting CMOS matrix operation modes via SPI interface;
- Data acquisition via ISA bus from FPGA Xilinx Spartan3 based card that collects preliminary information and processes it;
- Control other equipment of HS301 camera;

Realized measurement modes

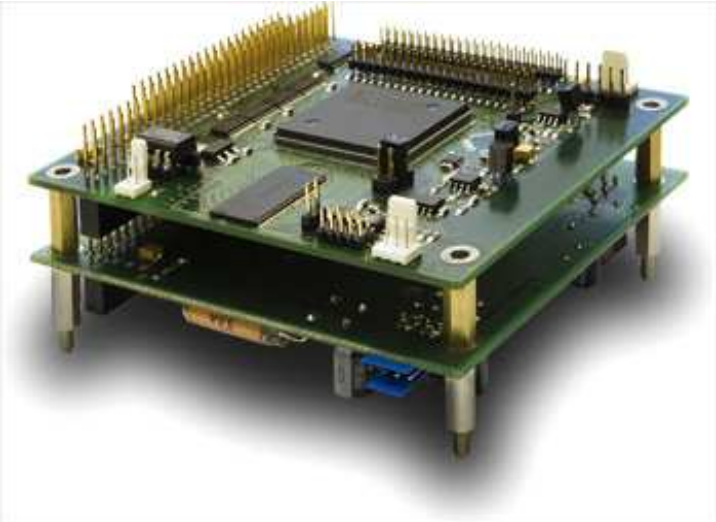
- Snapshot (limited) mode;
- Non-stop mode;
- Full image with maximal resolution mode;
- Full vertical binning mode;
- Single-track mode;
- Multi-track mode;
- Regions mode;
- 8, 10, 14-bit read with 48 MHz sampling rate mode;

Camera's technical characteristics

Photo detector type	CMOS Fillfactory LUPA-4000-M photo detector
Solar cell (pixel)	Size 12x12 µm
Photosensitive field size	24.576x24.576 mm
ADC capacity	8, 10, 14-bit
Camera dynamic range	Not less than 67 dB
PC communication interface	Ethernet 100 Base-T

Benefits and features

- Adapted Linux distribution to use in series of devices;
- Extended support of configuration files for creating new cameras without any changes in source code;
- Diskless logging system;
- Creation of universal protocols for series of devices;
- Emulator mode for quick debugging of new client software functions;



Technologies	Embedded Linux, PC/104, Ethernet, ISA
Tools and interfaces	GCC, GDB, Eclipse
Programming languages	ANSI C, C++
Project management tools	MS Project, CVS
Efforts	40 man-days
Duration	1,5 months