Xylon d.o.o.

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Features

- Second generation of Xylon's design framework for automotive Surround View Driver Assistance (DA) Systems – supported new system features!
- Based on Xilinx® Spartan®-6 FPGA
- Development hardware platform includes everything for installation in test vehicles: boards, cameras, lenses and cabling
- Preloaded Surround View DA demo application can be adjusted to different vehicle types

- Calibration software for lens correction, camera perspective corrections and image stitching
- Reference FPGA design with evaluation logicBRICKS™ IP cores
- Stitched video from 4 cameras can be displayed on PC monitor; supported multiple surrounding views, including the 3D visualization
- Downloadable Installation from Xylon's FTP
- 25 hours of tech support (e-mail)

Figure 1: The second-generation logiVIEW-SVK Development Platform for Automotive Surround View DA Systems

Applications

- Automotive Driver Assistance Systems: Surround View (Bowl View, Bird's Eye View), Rear-View Camera, others

General Description

Four-Camera Surround View parking assistance is an emerging automotive Driver Assistance (DA) application which greatly improves a driver's safety and comfort. The Surround View DA provides an unmatched awareness of the situation by enabling the driver to see 360-degrees around the vehicle on the LCD instrument cluster or the Central Information Display (CID).

The surroundings can be seen from different perspectives, including the bird's eye view perspective typical for first generation systems, which eliminates all blind spots during critical and precise maneuvers in crowded spaces. In this way the system prevents the driver from colliding with objects scattered around the vehicle or which are outside of the driver's field of vision.

Find more information about the Surround View Driver Assistance application:
http://www.logicbricks.com/Solutions/Surround-View-DA-System.aspx

Figure 2: Xylon Surround View DA Demo – One of available views

The logiVIEW-SVK Surround View DA Development Platform and Toolset enables automotive designers to quickly start their new Surround View DA design based on Xilinx Spartan-6 FPGA. The toolset includes the reference FPGA design with evaluation logicBRICKS IP cores, calibration and application software, as well as full documentation.

The second generation of the logiVIEW-SVK introduces several new advanced features, which are important for development of new generation automotive systems. The most important new feature is the ability of 3D visualization of vehicle's surrounding by projecting captured camera video images on the bowl-shaped ground surface. This type of visualization is more natural and easier to use. While bird's eye surround view systems have the POV (Point of View) defined orthogonally above the vehicle, new systems with the bowl-view capability can show vehicle's surroundings from different pre-programmed POVs, i.e. from the front of the vehicle, etc.

Xylon's 1st GEN SV

Planar Ground Surface

Xylon's 2nd GEN SV

Bowl-Shaped Ground Surface
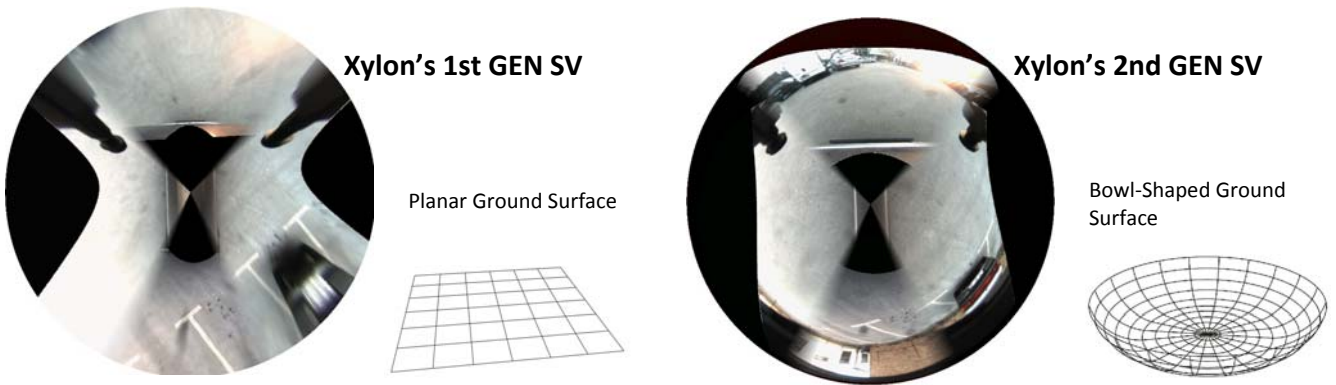
Figure 3: The difference between projections onto a planar ground and a bowl-shaped surfaces

The 3D visualization is supported by an enhanced logiVIEW Perspective Transformation and Lens Correction Image Processor IP core, which is the key implementation element for the Surround View application. Xylon has also improved the Calibration Software to support new logiVIEW IP core's features. The software enables faster and easier lens and vehicle calibrations, selection of different bowl-shaped ground surfaces, sophisticated preview options, etc.
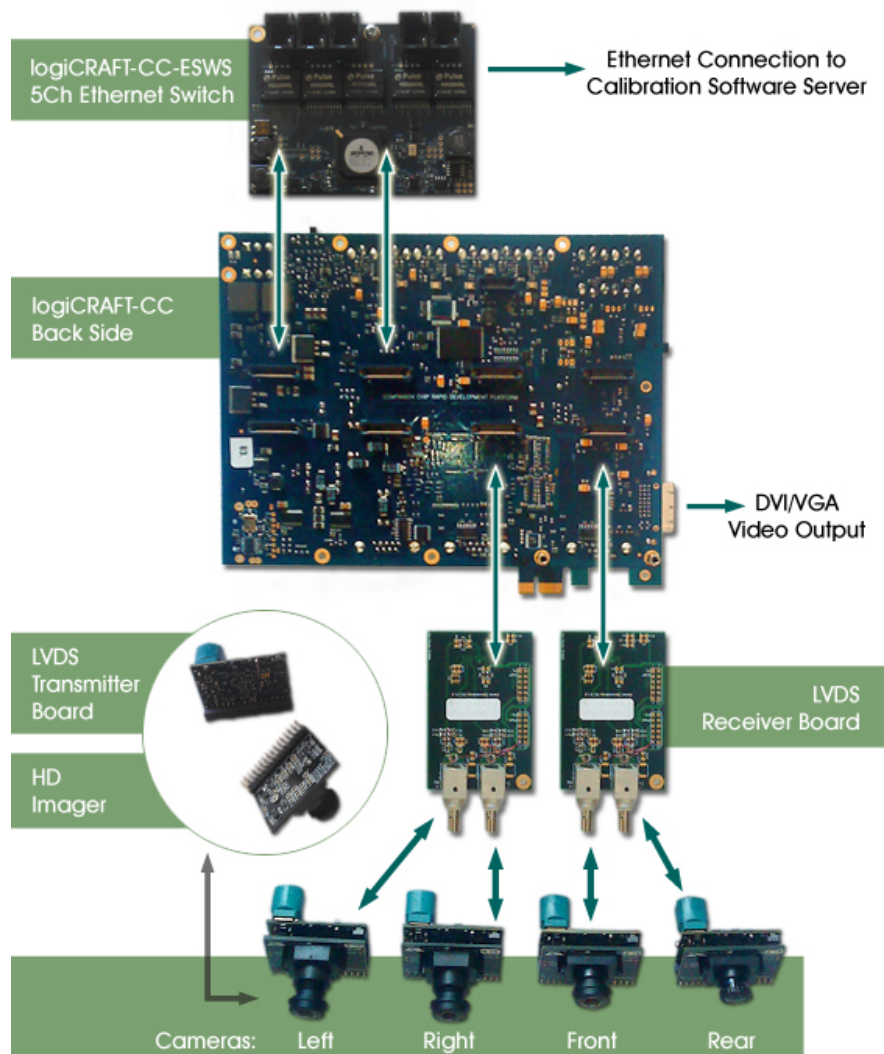
Figure 3: logiVIEW-SVK Development Platform

Dynamic Calibration, also called Load Calibration, is an additional system's improvement. It is run-time executed on the vehicle and enables preservation of a perfect image stitching by compensating, i.e. different vehicle's loads.

Besides these important feature upgrades, the logiVIEW-SVK development platform comes with higher quality automotive camera imagers and Xylon's logiCRAFT-CC development board. The logiCRAFT-CC has a bigger Xilinx device that offers more room for changes, improved memory subsystem capable to support higher resolution imagers, and more expansion connectors to allow for a quick change of camera interfacing hardware, or a number of used cameras.

logicBRICKS IP Cores

The key elements of this development platform are Xylon logicBRICKS IP cores designed and optimized for use in Xilinx programmable devices. The reference design provided with the platform is implemented with evaluation logicBRICKS IP cores.

Find more information about logicBRICKS evaluation IP cores by visiting:
http://www.logicbricks.com/logicBRICKS/Evaluation-logicBRICKS.aspx

logiVIEW Perspective Transformation and Lens Correction Image processor

The logiVIEW IP core is the key IP core for the design of the Surround View and similar multi-camera systems. This IP core removes fish eye lens distortions, makes perspective corrections to all camera video inputs and stitches the resulting single image in real-time. A programmable homographic transformation matrix enables different perspective transformations, such as rotating, resizing, translating, cropping, as well as simultaneous combinations of all of these transformations. When configured to use Memory Look-Up Tables (MLUT), the logiVIEW can make any nonlinear transformation.

Find more information by visiting www.logicbricks.com/Products/logiVIEW.aspx.

logiCVC-ML Compact Multilayer Video Controller

The logiCVC-ML IP core is an advanced display graphics controller for LCD and CRT displays, which enables an easy video and graphics integration into embedded systems with Xilinx Zynq-7000 EPP and FPGAs. This IP core is the cornerstone of all 2D and 3D GPUs. Though it's main function is to provide flexible display control, with resolutions up to 2048x2048 pixels, it also includes a level of hardware acceleration: alpha blendings, panning, buffering of multiple frames, etc.

Find more information by visiting www.logicbricks.com/Products/logiCVC-ML.aspx.

logiWIN Versatile Video Input

The logiWIN IP core accepts a streaming video input, decodes it and converts into the RGB format. The input video can be real-time scaled, de-interlaced, cropped and positioned on the video display. The logiWIN integrates high-quality anti-aliasing algorithm that guarantees high picture quality without visible artifacts.

Find more information by visiting www.logicbricks.com/Products/logiWIN.aspx.

logiMEM_arb DDR Memory Controller

Designed to arbitrate between user ports, it converts supported bus protocols to MCB protocol needed for interfacing with Xilinx Spartan-6 Memory Controller Block (MCB). It is perfectly suited for UMA (Unified Memory Architectures) because it provides memory access to Xilinx MicroBlaze™ soft-CPU via XCL and AMBA AXI ports, and IP cores supporting PLBv4.6, AXI and Xylon proprietary XMB bus. The IP core can interface any number of MCBs in the Spartan-6 FPGA. The logiMEM-ARB optimizes use of the MCB and increases system's efficiency and overal memory bandwidth. Well designed systems can achieve more than 90% of theoretically available memory bandwidth.

Find more information by visiting www.logicbricks.com/Products/logiMEM_arb.aspx.

logiSDHC SD Card Host Controller

The Secure Digital (SD) card Host Controller IP core designed to transfer data from the system memory to the SD card's data bus, and vice versa. Implemented DMA mechanism enables fast data transfer and requires minimal CPU activities. The logiSDHC IP core is SD Host Controller Standard Specification Version 2.00 compliant. The IP core deliverables includes the FatFs file system.

Find more information by visiting http://www.logicbricks.com/Products/logiSDHC.aspx

Calibration Software

Provided calibration software enables easy adoptions of the Surround View DA system to different vehicle models. The software enables calibration of various camera (lens) parameters and camera positioning on the vehicle.

Find more information by visiting
http://www.logicbricks.com/Solutions/Surround-View-DA-System/Camera-Lens-Vehicle-Calibration-Software.aspx

Figure 4: The Calibration Software offers powerfull Preview modes

Package Content

Hardware

- 1x Xylon logiCRAFT-CC Development Board (Xilinx Spartan-6 XC6SLX150T-FG676)
- 2x LVDS receiver boards (logiCRAFT-CC side)
- 4x LVDS transmitter boards (camera side)
- 1x Xylon logiCC-ESW5 5-ch Ethernet Switch board
- 4x Omnivision OV10635 1-megapixel camera sensors
- 4x Largan fish eye (wide FOV) 95321A lenses

Reference FPGA Design

The FPGA design is compatible with the Xilinx Platfrom Studio implementation tool.

- Xylon Surround View Driver Assistance demo

logicBRICKS IP Cores[*]

- logiVIEW Perspective Transformation and Lens Correction Image Processor
- logiCVC-ML Compact Multilayer Video Controller
- logiWIN Versatile Video Input
- logiSDHC SD Card Host Controller
- logiMEM_arb Flexible DDR Memory Controller
- logicBRICKS LVDS camera interface

* Xylon provides the evaluation IP cores with the kit

Applications and Drivers

- Surround View demo application
- Lens and Vehicle calibration software

Documentation

- Demo User's Manual
- logicBRICKS User's Manuals
- Calibration software User's manual

Cabling and Adapters

- 4x long cables for camera interfacing; suitable for vehicle installations
- Power supply

Recommended Design Experience

The user should have experience in the following areas:

- Xilinx design tools

The logicBRICKS IP cores are fully supported by the Xilinx Platform Studio and the EDK, and their use does not require any particular skills beyond general Xilinx tools knowledge.

Related Xylon Products

The logiVIEW-SVK demonstrates modularity on all levels: software, board, FPGA, and IP cores. The base board of the system is Xylon's logiCRAFT-CC Development Board:

   URL: http://www.logicbricks.com/Products/logiCRAFT-CC.aspx

Xylon also offers an additional development kit for automotive applications – logiPD-LDW Development Platform for Pedestrian Detection and Lane Departure Warning:

URL: http://www.logicbricks.com/Products/logiPD-LDW.aspx

Ordering Information

This product is available directly from Xylon. Please visit our web shop or contact Xylon for pricing and additional information:

Email: sales@logicbricks.com
URL: http://www.logicbricks.com/Products/logiVIEW-SVK.aspx

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Related Information

Xilinx Programmable Logic

For information on Xilinx programmable logic or development system software, contact your local Xilinx sales office, or:

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Revision History

Version	Date	Note
1.00.a	01.04.2011	Initial release.
2.00.a	23.05.2012	Document describes the second generation of Xylon's Automotive Surround View Development Kit