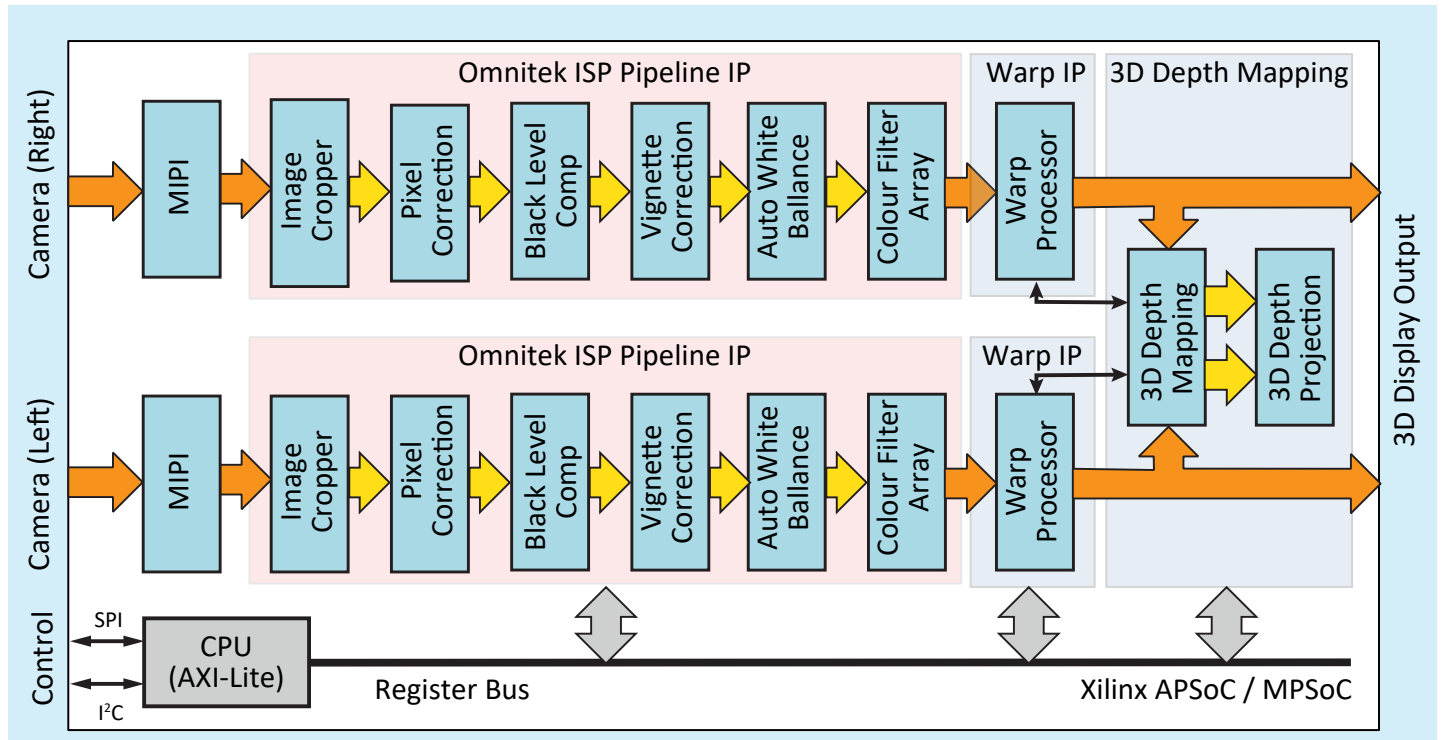


3D Depth Mapping Xilinx FPGA IP



Summary

Omnitek's 3D Depth Mapping IP allows depth calculations to be made from the 3D information contained within left and right video streams. This can then be graphically displayed in the form of Depth (distance) maps and histograms.

Applications for such 3D analysis include stereo microscopy, virtual reality, augmented reality, automotive driver assist systems (ADAS), drones and surveillance systems.

Typically this IP is used in conjunction with Omnitek's ISP IP and Omnitek's Warp IP to perform lens correction and perspective mapping before 3D depth calculations are performed. This can be seen in the diagram above.

Connectivity

Omnitek provides a large range of complementary IP Cores for video processing and connection. These IP cores can be used individually or in combination to provide FPGA solutions for applications in broadcast, AV, aerospace/defence, medical and automotive industries. Omnitek IP Cores can be supplied as discrete blocks for inclusion in your own designs, as single chip solutions or Omnitek can provide a bespoke solution which can be tailored to your specific needs.

Supported Devices

The 3D Depth Mapping IP can be implemented on the following Xilinx devices:

- Artix-7, Kintex-7 and Virtex-7
- Kintex UltraScale and Virtex UltraScale
- Kintex UltraScale+ and Virtex UltraScale+
- Zynq-7000 APSoC and Zynq UltraScale+ MPSoC

Key Features

- Very small FPGA resource footprint
- Very low latency
- Image resolutions up to 4096 pixels x 2160 lines up to 120Hz
- Wide Dynamic Range support
- Automated disparity map calculation for L/R images
- Automated 3D geometry extraction
- 3D Image Correction
- Real time geometry correction for 3D camera toe-in or other 3D rig artefacts using Warp IP.
- Bare Metal and Linux Support Libraries
- Fully compatible with Omnitek OSVP, HDR, Warp and other IP Cores to provide a comprehensive image processing package.

Applications

The 3D Depth Mapping IP can be used in a range of applications including:

- Stereo Microscopy
- Medical Imaging
- Virtual & Augmented Reality
- Automotive Driver Assist Systems (ADAS)

Additional Requirements

The 3D Depth Mapping IP requires an ARM processor, MicroBlaze or any AXI4-Lite CPU to allow configuration of each IP Block and to take measurements via the Register Bus.



Implementation Examples

Depth Mapping

Using the left and right input images, a Depth Map can be generated where each pixel in the image by calculating the distance of each point in the left image compared to the right image. From this the 3D software colour coded the display from red to violet to indicate the distance.

Left Image

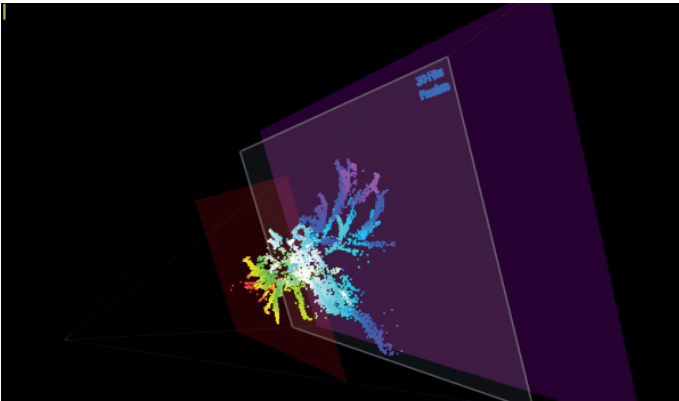
Right Image



The thistle image above shows the colour mapping of the image elements and their relative distance from the viewer or screen.

3D Depth Projection

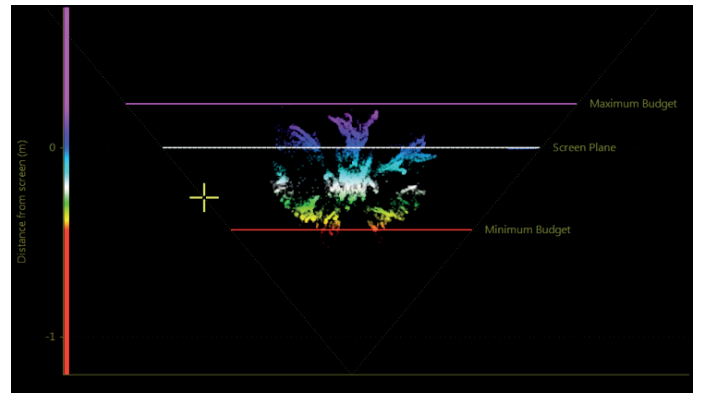
Using the 3D Depth Map information, 3D Projection can be used to calculate the XYZ coordinates for every point in the display. This then allows the 3D Depth Map to be positioned in 3D space.



The image above shows the 3D depth-mapped image rotated in X, Y, Z space to show the elements in front of and behind the screen/viewing plain.

3D Depth Plan

Using the 3D Depth Map information, a 3D Depth Plan can be generated to establish the total depth of an object.



The image above shows the 3D Depth-Mapped image from above to display the maximum and minimum depth budget of the elements in front of and behind the screen/viewing plain.

Working with Stereo 3D video presents both many opportunities and many challenges. Omnitek's 3D IP supports the development and use of systems that build on the opportunities that Stereo 3D offers. The company's 3D Analyser allows anyone using Stereo 3D to analyse the geometry and the colour balance of the image streams they produce. The Image Signal Processor and HDR Tone Mapping IP allow the colour to be adjusted in real time, while the Warp Processor can correct the captured images for alignment issues.

Reference Design

Please contact Omnitek for more information.

Reference Platform

Please contact Omnitek for more information.



UK Head Office

Intec 3, Level 1
Wade Road
Basingstoke
Hampshire
RG24 8NE

Tel: +44 (0)1256 345900

Fax: +44 (0)1256 345901

Email: consultancy@omnitek.tv

About Omnitek

Omnitek is a leading independent consultancy company specializing in the design of products and IP for the broadcast, post-production, digital film, AV, medical, aerospace/defence, automotive and consumer industries. Since its foundation, Omnitek has completed many successful design projects for major equipment manufacturers throughout Europe, Asia, and the United States.

Omnitek reserves the right to change specifications without notice. Refer to the Omnitek web site for the latest specifications and further information:

www.omnitek.tv

