

Direct Link Sensor DLS-Modules



A Marriage of Projector and Camera for Next Generation Imaging Solutions



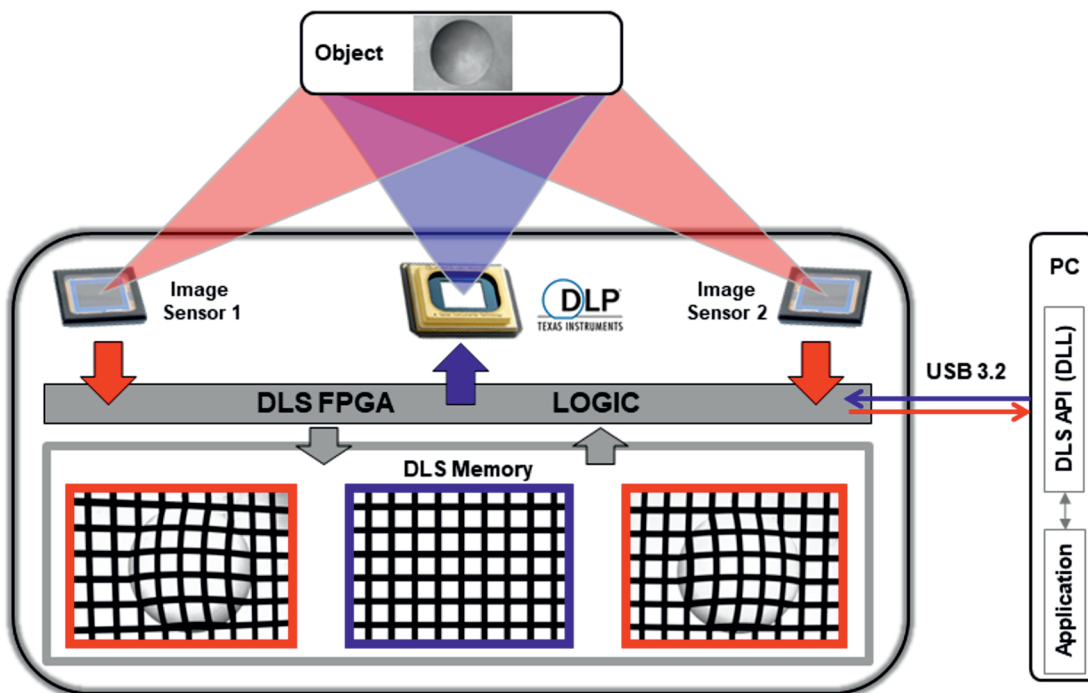
The success of digital image processing solutions depends on both, the imaging device and appropriate illumination. Frequently, specifically structured light patterns are required and DLP® micro-mirror projection turned out to be fast, flexible and proven for that purpose. Multiple different devices, projectors and cameras, used to be combined for pattern

generation and image sensing. Such setups cause challenges for precise synchronization and computer interfacing. ViALUX has linked together the image sensor chips and the DLP micro-mirror device into the same electronic control circuitry resulting in ONE integrated device. This Direct Link Sensor (DLS) represents a new class of imaging tools enabling advanced vision solutions.

DLS Principle of Operation

The ViALUX FPGA logic controls both the high-performance DLP chip for fast and precise pattern projection and the image sensors for digital imaging. In that way pattern generation and image recording are precisely synchronized, also for partial sensor readout in a region of interest. Frame rates vary from 166 fps to 5.150 fps (ROI) for each camera in parallel.

The schematic below shows the DLS architecture with the major data flow.



A sequence of user-defined projection patterns is uploaded into the DLS memory (RAM) and the data can be used for a single projection or for a projection loop. The illuminated object is recorded by the sensors and the images are buffered in the on-board RAM that holds up to 1.592 pictures (10 bit, 1.920 x 1.200 pixels), ready for download to the PC for further processing. All data flow operations are executed by one FPGA device enabling the outstanding real-time precision.

Streaming data to and from the on-board RAM is realized by the USB 3.2 SuperSpeed transfer implemented on the DLS system. The upload is further enhanced by lossless on-the-flight compression and pixel binning is available as an option for image download.



A custom application program controls the DLS system through the DLS API, an application development interface supporting rapid system development. The DLS API is implemented as a dynamic-link library (DLL) and the functions are designed to build an application with a minimum of programming effort providing maximum control capabilities at the same time. The user can define any type of pattern sequence that may differ in bit depth, number of pictures, and frame rate. The DLS principle of operation offers significant advantages for machine vision applications requiring flexible scene illumination:

- Projection and imaging components are precisely synchronized
- High bandwidth transfers are running independent from PC
- Hardware integration guarantees real-time data flow
- The DLS-Module requires only one USB 3.2 interface
- The clear API software facilitates rapid application development

Models

The DLS-1 and DLS-2 Modules address different field of view and working distance (WD), respectively. The diagonal field of view (DFOV) is given by $DFOV = 0.69 \times WD$.

The DLS-1 Module is equipped with one DLP projection and one image sensor that can be slightly tilted to adjust the working distance in the range 1.300 - 3.000 mm. The distance between projection lens and imaging lens is 410 mm.

The DLS-2 Module supports two image sensors and one DLP chip. All three chips are in a fixed position. The customer can choose a configuration for either 600 mm or for 1.000 mm working distance. The base length between the two imaging lenses is 160 mm.

Long lasting high-power LEDs form the light source for the two DLS-Modules. There are four wavelength options provided for both models to support a variety of applications in the visible and near-infrared spectrum: White, Blue 460 nm, NIR 730 nm, NIR 850 nm.

Extended software option

An additional software package zSnapper® SDK (zSn.dll) is available as an optional extension for DLS-Modules enabling high-speed and high-precision 3D coordinate acquisition. This powerful 3D measurement software has been developed for the ViALUX 3D scanners and is now released on module level. It delivers (x, y, z) coordinates directly and automatically for use in 3D machine vision.

Order Information

| Product | Configuration | P/N | LED Color Option | Software Option |
|--------------|--|------|--|------------------------------------|
| DLS-1 Module | 1 x DLP projection 1 x image sensor | 9737 | standard: white 460 nm blue 730 nm NIR 850 nm NIR | P/N 9623 zSnapper® SDK software |
| DLS-2 Module | 1 x DLP projection 2 x image sensor | 9740 | standard: white 460 nm blue 730 nm NIR 850 nm NIR | P/N 9623 zSnapper® SDK software |

*DLP is a registered trademark of Texas Instruments.

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