Viewpointe

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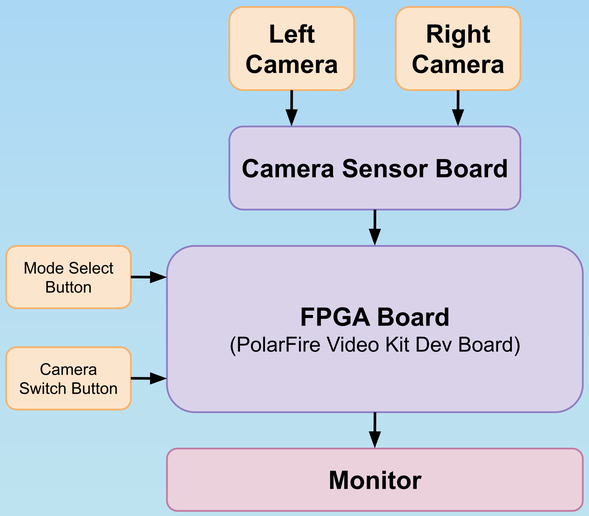
Background

Alcon's existing Ngenuity system seeks to capture stereo images from an ophthalmic surgical microscope, process the two images on a host computer, and provide a high-definition 3D image that can be displayed on a supporting display. This provides the surgeon with both a higher resolution as well as an ergonomic working environment. The use of a separate computer and a USB communication protocol, however, has introduced significant delays and image quality issues into the system, which Alcon seeks to correct.

Overview

To reduce latency, we attempt to remove the need for intensive graphics processing on the host computer by utilizing a FPGA. The two image inputs will be processed into a display form suitable for a 3D monitor. The user will have to choose between visual formats, including side-by-side, top-bottom, and traditional intersampled mosaic. The input type will also support both HDMI and DisplayPort. All processing will happen on the camera itself, without requiring an external computer.

Block Diagram



Hardware

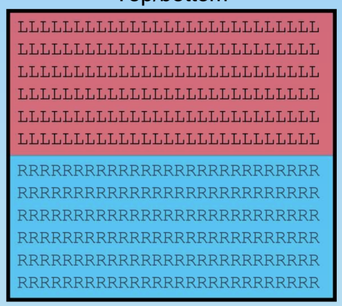
PolarFire Video Kit
- 64 bit RISC-V CPU
- Compatible with MIPI CSI-2, DSI, and CS
- HDMI 2.0 and HDMI 1.4

Dual Camera Sensor Board
- Allows for use of 4K HDMI port
- Resolves compatibility issues

Alcon Camera Lens
- Connected to 4K sensor board
- Allows for better focus and production of final 3D image

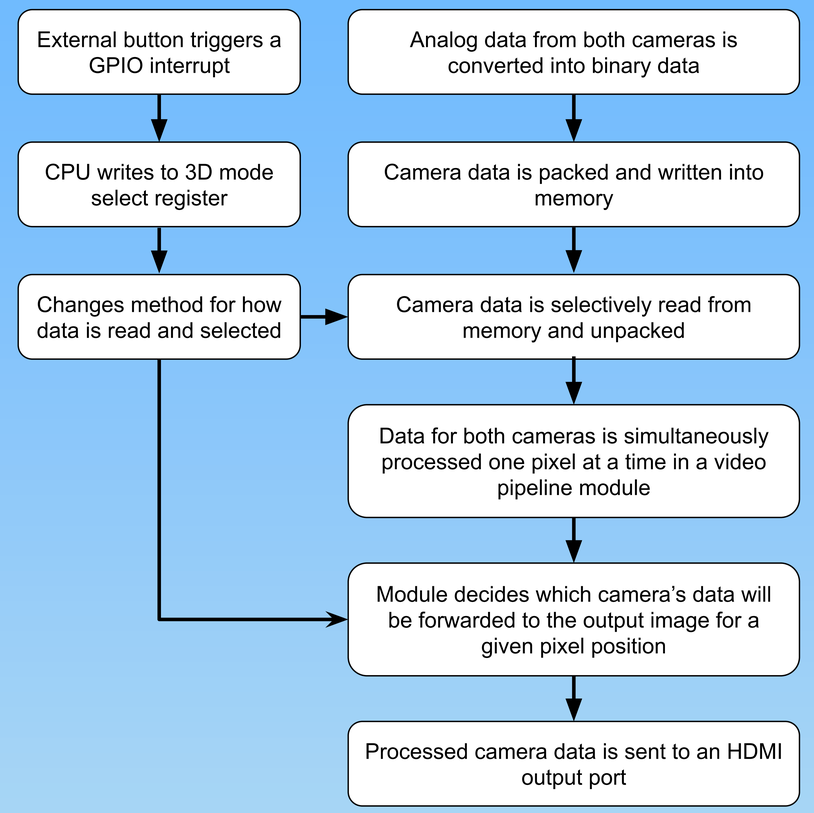
3D Modes

Top/bottom



Row-interleave

Software Flow



Final Product

In the final enclosure, camera sensors are aligned according to an adapter that is specific to the microscope. Stereo lens feeds are visualized in 3D via HDMI, and can be polarized by specialized monitors. The user can switch between display modes and camera order.

Alcon

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