

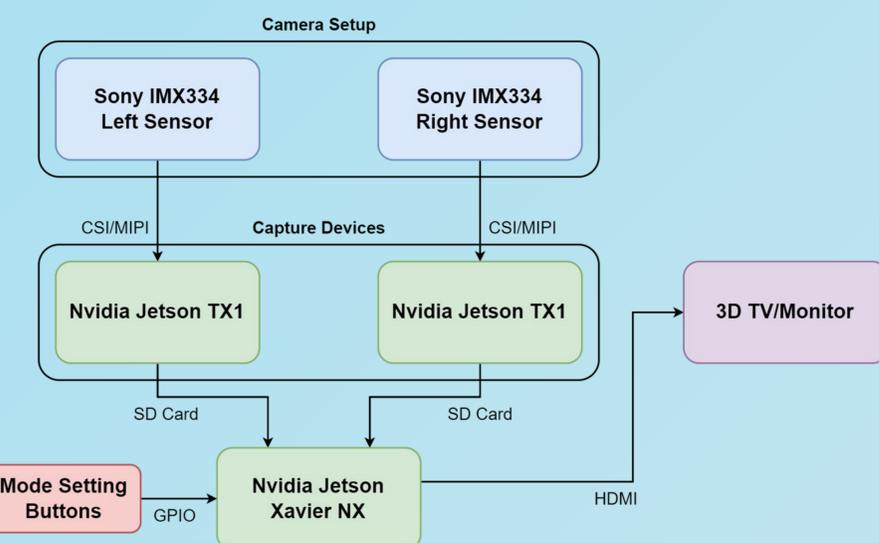
Background

Alcon developed a stereo camera mounted on a microscope for eye surgery, displaying the image on a 3D monitor to provide the surgeon with better depth, as well as providing an image to others in the operating theater. On Alcon's current setup, a powerful host computer handles the video processing. Our goal is to create a proof of concept that can bypass the need for the host computer with a cheaper and more user-friendly alternative.

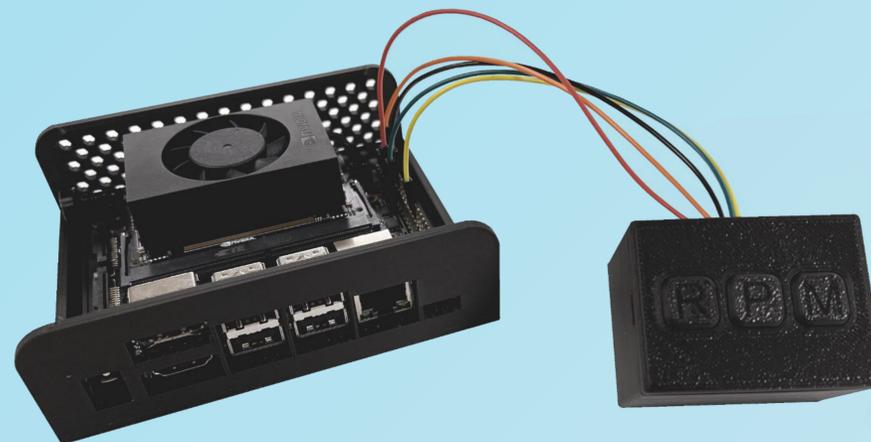
Overview

Video is recorded from two separate camera sensors on a purpose-built stereo mount. The 4K/30 or 1080p/60 videos are saved as .mp4 files onto SD cards via the Jetson TX1s, and then transferred to the Jetson Xavier NX. Based on the chosen mode, the Xavier NX combines the two streams into a top-bottom, side-by-side, or row-interleaved configuration that can be viewed with the 3D monitor. The monitor then displays the stream as is (row-interleaved) or converts it to a 3D format (top-bottom or side-by-side).

Hardware Block Diagram



Video Processing & Display



- The controller attached to the Jetson Xavier NX changes the camera resolution, 3D mode, and polarity of the video
- Xavier NX shown with the case cover removed

Hardware Components



Sony IMX334 Sensor

- ES0522F.IR Lens Setup
- Assembled by Leopard Imaging
- Interfaced with MIPI CSI-2



Nvidia Jetson Xavier NX

- Designed for visual computing
- Runs Linux with JetPack SDK
- Output either HDMI or DisplayPort



Nvidia Jetson TX1/TX2

- An older Nvidia development platform
- Quad-core ARM Cortex-A57
- Maxwell GPU w/ 256 CUDA cores



3D Monitor

- Purpose-built 55" monitor for use in an operating theater
- Rows of pixels have alternating polarities that create the 3D effect

Video Capture Setup



- Sony IMX334 cameras are mounted 65mm apart, equal to the average human IPD
- Custom 3D printed TX1 case provides access to all necessary ports and maintains sufficient cooling
- Cameras connected to TX1 for video capture

Software Block Diagram

