**ADUVC - AN AREADETECTOR DRIVER FOR USB VIDEO CLASS (UVC)**

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**Abstract**

Most devices supported by the Experimental Physics and Industrial Control System (EPICS) areaDetector project fall under one of two categories: detectors and cameras. Many of the cameras in this group can be classified as industrial cameras, and allow for fine control of exposure time, gain, framerate, and many other image acquisition parameters. This flexibility can come at a cost however, with most such industrial cameras’ prices starting near one thousand dollars, with the price rising for cameras with more features and better hardware. While these prices are justified for situations that require a large amount of control over the camera, for monitoring tasks, and some basic data acquisition, the use of consumer devices may be sufficient while being far less cost-prohibitive. The solution we developed was to write an areaDetector driver for USB Video Class (UVC) devices, which allows for a variety of cameras and webcams to be used through EPICS and areaDetector, with most costing under $100.

**The USB Video Class (UVC) Standard**

The UVC standard is utilized almost universally among USB cameras and video devices, most notably in consumer webcams. Most operating systems that allow for viewing camera images via a dedicated application (i.e. the Windows “Camera” application) are internally using a custom UVC driver for camera control.

- Each UVC device must have a series of predefined formats within firmware that can be read according to the standard, supplying all required image information to the device prior to streaming initialization, including the data type of the output, and the color mode of the resulting image.
- Each UVC device must send frames back to the driver in a standardized format. UVC gives us a high level communication protocol that can be reused between most devices, much like how ADCore contains functionality common to all areaDetector cameras.

**ADUVC – An EPICS areaDetector driver for UVC**

Uses libusb (for usb communication), libuc (for handling UVC protocol commands), and libjpeg (for handling JPEG decompression). ADUVC builds an EPICS shell around libuc, allowing users to call library functions through write requests on EPICS process variables (PVs). The driver is based on other areaDetector drivers, most notably the ADPointGrey and ADPointGrey drivers. It uses a callback function defined during the libuc start streaming call to grab the frames from the UVC device, convert them into the areaDetector NDArray standard, and pass them back up the chain to the EPICS layer. All of the other supported camera parameters in libuc are represented internally as the device as PVs, and when writing a new value through a user interface (Figure 1), the appropriate libuc function is fired sending the new value for the appropriate parameter to the camera.

We tested ADUVC with 8 different cameras at varied price points, and observed very impressive results relative to the costs (Figure 5). Unique form factors were also found when using ADUVC with cameras, and the underlying base, called ADCore.

**Figure 1:** The user interface screen developed for use with the ADUVC driver.

**Figure 2:** Formats supported by most UVC cameras. Most cameras support at least two such formats.

**Reference**


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