i.MX Video Capture Driver

Events

ipuX_csiY

This subdev can generate the following event when enabling the second IDMAC source pad:

- V4L2_EVENT_IMX_FRAME_INTERVAL_ERROR

The user application can subscribe to this event from the ipuX_csiY subdev node. This event is generated by the Frame Interval Monitor (see below for more on the FIM).

Controls

Frame Interval Monitor in ipuX_csiY

The adv718x decoders can occasionally send corrupt fields during NTSC/PAL signal re-sync (too little or too many video lines). When this happens, the IPU triggers a mechanism to re-establish vertical sync by adding 1 dummy line every frame, which causes a rolling effect from image to image, and can last a long time before a stable image is recovered. Or sometimes the mechanism doesn't work at all, causing a permanent split image (one frame contains lines from two consecutive captured images).

From experiment it was found that during image rolling, the frame intervals (elapsed time between two EOF's) drop below the nominal value for the current standard, by about one frame time (60 usec), and remain at that value until rolling stops.

While the reason for this observation isn't known (the IPU dummy line mechanism should show an increase in the intervals by 1 line time every frame, not a fixed value), we can use it to detect the corrupt fields using a frame interval monitor. If the FIM detects a bad frame interval, the ipuX_csiY subdev will send the event V4L2_EVENT_IMX_FRAME_INTERVAL_ERROR. Userland can register with the FIM event notification on the ipuX_csiY subdev device node. Userland can issue a streaming restart when this event is received to correct the rolling/split image.

The ipuX_csiY subdev includes custom controls to tweak some dials for FIM. If one of these controls is changed during streaming, the FIM will be reset and will continue at the new settings.

- V4L2_CID_IMX_FIM_ENABLE

Enable/disable the FIM.

- V4L2_CID_IMX_FIM_NUM

How many frame interval measurements to average before comparing against the nominal frame interval reported by the sensor. This can reduce noise caused by interrupt latency.

- V4L2_CID_IMX_FIM_TOLERANCE_MIN

If the averaged intervals fall outside nominal by this amount, in microseconds, the V4L2_EVENT_IMX_FRAME_INTERVAL_ERROR event is sent.

- V4L2_CID_IMX_FIM_TOLERANCE_MAX

If any intervals are higher than this value, those samples are discarded and do not enter into the average. This can be used to discard really high interval errors that might be due to interrupt latency from high system load.

- V4L2_CID_IMX_FIM_NUM_SKIP

How many frames to skip after a FIM reset or stream restart before FIM begins to average intervals.

- V4L2_CID_IMX_FIM_ICAP_CHANNEL / V4L2_CID_IMX_FIM_ICAP_EDGE

These controls will configure an input capture channel as the method for measuring frame intervals. This is superior to the default method of measuring frame intervals via EOF interrupt, since it is not subject to uncertainty errors introduced by interrupt latency.

Input capture requires hardware support. A VSYNC signal must be routed to one of the i.MX6 input capture channel pads.

V4L2_CID_IMX_FIM_ICAP_CHANNEL configures which i.MX6 input capture channel to use. This must be 0 or 1.

V4L2_CID_IMX_FIM_ICAP_EDGE configures which signal edge will trigger input capture events. By default the input capture method is disabled with a value of IRQ_TYPE_NONE. Set this control to IRQ_TYPE_EDGE_RISING, IRQ_TYPE_EDGE_FALLING, or IRQ_TYPE_EDGE_BOTH to enable input capture, triggered on the given signal edge(s).

When input capture is disabled, frame intervals will be measured via EOF interrupt.

File list

drivers/staging/media/imx/ include/media/imx.h include/linux/imx-media.h

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