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PHYTEC-USB-CAM Series under Linux

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1 Introduction

This application note applies to the following products:

Part number	Name	Details	Color format
AK088-UVC	USB-CAM-004H	CMOS 744x480	Bayer GRBG*
AK090-UVC	USB-CAM-104H	CMOS 744x480	Bayer GRBG*
AK092-UVC	USB-CAM-052H	CMOS 2592x1944	Bayer GBRG
AK094-UVC	USB-CAM-152H	CMOS 2592x1944	Bayer GBRG

***Caution!** The firmware of the camera assign a false color format at the moment. In the next firmware version, it will be fixed. Correctly, the color format should read as "Bayer GBRG". Please ask us for the current state of the firmware.

This document describes how to use the color cameras of the PHYTEC USB-CAM-Series with openSUSE 12.2. It is important that this requires an UVC compliant firmware in the cameras. Cameras of the type AK088 to AK094 (without UVC identifier) are not supported.

To enable the uvcvideo driver to recognize the color format of the cameras, the driver has to be adapted. A patch containing the needed adjustments is available for this. After patching the driver, the kernel needs to be rebuilt. The following sections describe how to patch the driver and rebuild the kernel. Further, an example is given for live image output by using the GStreamer.

Monochrome cameras with UVC firmware require no kernel patch and will be not described here. These cameras have the following part numbers:

Part number	Name	Details	Color format
AK087-UVC	USB-CAM-003H	CMOS 744x480	Y8
AK089-UVC	USB-CAM-103H	CMOS 744x480	Y8
AK091-UVC	USB-CAM-051H	CMOS 2592x1944	Y8
AK093-UVC	USB-CAM-151H	CMOS 2592x1944	Y8

For more information on our USB cameras, please read our Manual L-740 "USB-CAM-Series." There you get more details about this series.

Note:

Manual L-740 is for cameras with standard firmware. However, the hardware features described are the same.

System used for evaluation:

Processor: Intel® Core™2 CPU 4300 @ 1.80 GHz
Memory: 2 GByte
Video carte: nVidia Geforce 7100 GS (NV44)
Kernel: Linux 3.4.6-2.10-default i686
Distribution: openSUSE 12.2 (i586)
KDE: 4.8.4 (4.8.4) „release 2“

2 How-to ...

2.1 Install the Packages

Use the following commands to install the required packages, if they are missing in your system.

- `sudo sbin/yast -i ncurses-devel`
- `sudo sbin/yast -i patch`
- `sudo sbin/yast -i rpm-build`
- `sudo sbin/yast -i gcc`
- `sudo sbin/yast -i rpm`
- `sudo sbin/yast -i gstreamer-0_10`
- `sudo sbin/yast -i gstreamer-0_10-plugins-bad`
- `sudo sbin/yast -i gstreamer-0_10-plugins-base`
- `sudo sbin/yast -i gstreamer-0_10-plugins-good`
- `sudo sbin/yast -i gstreamer-0_10-plugins-ugly`
- `sudo sbin/yast2 -i gstreamer-0_10-utils`

2.2 Download and Unpack the Kernel

First, the kernel must be downloaded. In this example, the kernel 3.4.6 was chosen.

For this purpose, please change to the path `/usr/src` and run the following command:

- `sudo wget --no-check-certificate
http://www.kernel.org/pub/linux/kernel/v3.x/linux-3.4.6.tar.bz2`

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Then, the kernel must be unpacked with the following command:

- `sudo tar xjf linux-3.4.6.tar.bz2`

Further, a Linux symlink is set to the source directory:

- `sudo ln -s linux-3.4.6 linux`

2.3 Download and Execute the Patches

Please download the needed patch from our PHYTEC FTP.

- `sudo wget --no-check-certificate`
ftp://ftp.phytec.de/pub/ImageProcessing/USBCAM/Linux/Patch_for_uvc_support/0001-media-uvcvideo-add-bayer-formatt-GBRG-and-GRBG.patch

Copy the patch to /usr/src. Now, the following command must be executed:

- `sudo patch -p1 < "0001-media-uvcvideo-add-bayer-formatt-GBRG-and-GRBG.patch"`

You will be asked to designate the destination file.

For the first one use: /usr/src/linux/drivers/media/video/uvc/uvc_driver.c.

For the second: /usr/src/linux/drivers/media/video/uvc/uvcvideo.h.

2.4 Configure the Kernel

It will now create a copy of the current kernel configuration. This must be placed in `/usr/src/linux`. You will need to go to the folder `/usr/src/linux`. Then use the following commands:

- `sudo make mrproper`
- `sudo cp /boot/config-3.4.6-2.10-default ./config`

Please start now the Kernel configuration:

- `sudo make menuconfig`

First of all, you must use "Load on Alternate Configuration File". Confirm the now appearing screen with OK. This ensures that really the current kernel configuration is loaded.

In order to distinguish the newly built kernel from the current kernel and thus to avoid any conflicts, a new name for the kernel has to be assigned. To do so, rename "Local Version" (subitem 3) within the menu "General setup". For example, rename it to "-2.10-PHYTEC".

Please click EXIT. Next choose "Save to Alternate Configuration File" from the menu and confirm with OK. Close menuconfig by choosing EXIT.

2.5 Build the Kernel

With the following command start the construction of the new kernel:

- `sudo make rpm`

On our system, building the kernel took between 2 and 3 hours.

2.6 Install the Kernel

Go to the directory `/usr/src/packages/RPMS/i386`. Use the following command to install the rpm package.

- `sudo rpm -ivh kernel-3.4.6_2.10_PHYTEC-1.src.rpm`

Next you must create a RAM-Disk

- `sudo /sbin/mkinitrd`

After that, you can find the following files in the directory `/boot`:

- `vmlinuz-3.4.6-2.10-PHYTEC`
- `initrd-3.4.6-2.10.PHYTEC`

To use the new kernel when booting, it must be made known to the boot loader. For that use:

- `sudo /sbin/yast`

Choose „System“ → „boot loader“.

Now select the GRUB boot loader and go to the “Section Management”. There use ALT + e “Propose New Configuration”. Now with ALT + a “Clone Selected Section”.

You must set the following entries:

Section Name:	<choose a name>
Kernel Image:	<code>/boot/vmlinuz-3.4.6-2.10-PHYTEC</code>
Initial RAM Disk:	<code>/boot/initrd-3.4.6-2.10-PHYTEC</code>
Root Device:	<code>/dev/sda2</code> (mount by -part2 VGA Mode: e.g. 1024x768, 8 Bit (Modus 0x305)
Optional Kernel Command L...:	<code>resume=/dev/sda2</code>

Choose OK to confirm and set the newly created section on Def.

As a final step, please ALT + e and choose "Write bootloader boot code to disk". Finally, finish with ALT + o.

Now, restart the computer.

2.7 Confirme the Kernel

So you can make sure that you actually use the new kernel, please use the following command:

- `uname -a`

In the output should appear the name of the new kernel. You should also check the date.

2.8 Test the Camera with GStreamer

NOTE:

The current version of the Gstreamer converts the Bayer color format directly it to YUV format. You need to call the camera with the YUV color format and not with bayer.

General call:

- `gst-launch-0.10 v4l2src device=/dev/video0 ! video/x-raw-yuv ! ffmpegcolorspace ! xvimagesink`

Call with scaling:

- `gst-launch-0.10 v4l2src device=/dev/video0 ! video/x-raw-yuv ! ffmpegcolorspace ! videoscale ! video/x-raw-yuv,width=640,height=480 ! ffmpegcolorspace ! xvimagesink`