UDEV Rule

Ahmed Mansour

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Preface

Cameras are the foundation of any Remotely Operated Vehicle (ROV), serving as the pilot's eyes underwater. Beyond their role in visual observation, cameras are essential for computer vision tasks and are crucial in the development of autonomous underwater vehicles (AUVs).

1 Problem

When connecting the cameras to the Raspberry Pi, they pass their streams as devices with different indices, for example, **video0, video2, . . . etc** . This naming convention is confusing because we don't know which camera corresponds to which stream, making it challenging to arrange the cameras in the GUI.

2 Solution Theory

Since each camera has a **"Unique ID"** , even if they're identical, we use that ID to create a **"symbolic link"** with a unique name assigned by us. This allows us to identify which camera is at which position on the ROV and makes it easier to arrange them in the GUI.

3 Solution Steps

1. List all usb connected devices

   ```
   v4l2-ctl --list-devices
   ```

   ```
   mypi@mypi:/dev/input/by-id$ v4l2-ctl --list-devices
   bcm2835-codec-decode (platform:bcm2835-codec):
           /dev/video10
           /dev/video11
           /dev/video12
           /dev/media1

   bcm2835-isp (platform:bcm2835-isp):
           /dev/video13
           /dev/video14
           /dev/video15
           /dev/video16
           /dev/media0

   rapoo camera: rapoo camera (usb-0000:01:00.0-1.1.1):
           /dev/video2
           /dev/video3
           /dev/media3

   UVC Camera (046d:081b) (usb-0000:01:00.0-1.3):
           /dev/video0
           /dev/video1
           /dev/media2
   ```

2. Get the unique ID of each camera

```
mypi@mypi:~$ udevadm info --query=all --name=/dev/video2 | grep ID_SERIAL
E: ID_SERIAL=Sonix_Technology_Co.__Ltd._rapoo_camera_SN0001
E: ID_SERIAL_SHORT=SN0001
```

```
udevadm info --query=all --name=/dev/video_index |grep ID_SERIAL
```

3. Use the short one **"ID_SERIAL_SHORT= ....."** .
4. Create the Symbolic Link.

```
sudo ln -s /dev/video_index /dev/SYM_LINK_NAME
```

5. Make the symbolic links persistent (even after reboots or reconnecting devices), by creating a **udev rule** .
6. Create a rule file

```
sudo nano /etc/udev/rules.d/99-usb-cameras.rules
```

7. Write the following line

```
SUBSYSTEM=="video4linux", ATTR{ID_SERIAL}=="SHORT_ID", SYMLINK+="SYM_LINK_NAME"
```

8. Reload udev Rules

```
sudo udevadm control --reload-rules
sudo udevadm trigger
```

9. Test the feedback

```
mjpg_streamer -i "input_uvc.so -d  /dev/SYM_LINK_NAME -r 1080x720 -q 100 -f 30"
```

4 Problem Appeared

A new problem appeared after the udev rule being set is that when the raspberry reboots, the udev rules is removed and needs to be set again.

4.1 Solution

For this problem, a service is created the sets the udev rule again every time the raspberry reboots.

4.2 Solution Steps

1. Create the service file

```
sudo nano /etc/systemd/system/usb-camera.service
```

2. Write the service

```
[Unit]
Description=Create symbolic link for USB camera
After=multi-user.target

[Service]
ExecStart=/bin/bash -c "ln -sf /dev/video_index /dev/SYM_LINK_NAME"
Restart=always

[Install]
WantedBy=multi-user.target
```

3. Save the file and reload the systemd daemon

```
sudo systemctl daemon-reload
sudo systemctl enable usb-camera.service
```

4. Reboot then check the existence of the rule

```
ls -l /dev/SYM_LINK_NAME
```