Webcam and servo motor installation guide
By Group MK2J, Fall 2014 CMPT 433

Environment pre-conditions
- BeagleBone Black running version 3.8.13-bone68
- BeagleBone Black must have connected internet access to download the open source libraries
  - ie) Via Ethernet to Router

Webcam how-to-setup

1. Building x264:
   Install the following libraries for webcam:

   # git clone git://git.videolan.org/x264.git
   # cd x264
   # ./configure --enable-shared --prefix=/usr
   # make
   # make install

2. Building ffmpeg:

   # git clone git://git.videolan.org/ffmpeg.git
   # ./configure --enable-shared --enable-libx264 --enable-gpl
   # git remote set-url origin git://source.ffmpeg.org/ffmpeg
   # make
   # make install

3. Fixing library problem:

   # vi /etc/ld.so.conf
   add "/usr/local/lib" to the file and then type:
   
   # ldconfig

4. v4l2-ctl libraries setup:

   # sudo apt-get install v4l-utils
5. Install the imagemagick

```
# sudo apt-get install imagemagick
```

6. Run the script

After the library installed and set-up, in `/Webcam_part/` folder, run the shell script `webcam.sh` and it will automatically start taking frames in the background.

```
# cd Webcam_part/
# ./webcam.sh
```

The record.sh script is available for saving the frames for recording purpose.

The build script is to make the compiled C code.

7. Run the server

After the webcam setup is finished, go to `/webServer_part/`, and run “nodejs server.js” to start the server. After this, you can go to url of (ip_addr):3001 to view the webpage of our security system.

```
# cd webServer_part/
# nodejs server.js
```

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**Controlling Servo with BeagleBone Black**

1. **Equipment:**
   1. BeagleBone Black
   2. Pan/Tilt bracket
   3. 2x Micro servo
   4. Male to Male jumper wires

2. **Connecting the Servos**
   1. Connect the ground wire to P9 pin 1
   2. Connect the positive wire to P9 pin 3
   3. Connect the PWM wire to P9 pin 14
   - Refer to the “Cape Expansion Headers” image below if more than one servo is used
   - Note that the ground wire is usually black or brown and the PWM wire is usually orange or yellow

3. **Setting up the PWM pin**
   1. Backup the current Linux bootfile
# cd /boot/uboot
# cp uEnv.txt uEnv.bak

2. Edit uEnv.txt

# nano uEnv.txt

- add the following line into the uEnv.txt

  optargs=quiet drm.debug=7 capemgr.enable_partno=am33xx_pwm,bone_pwm_P9_14

- we could also manually do this by using the following commands(Will need to do it every reboot):

  # echo am33xx_pwm > /sys/devices/bone_capemgr.@/slots
  # echo bone_pwm_P9_14 > /sys/devices/bone_capemgr.@/slots

  - Note that the value for the @ sign is different for each user

4. Controlling the Servos

1. Initialize servo

# cd /sys/devices/ocp.3/pwm_test_P9_14.@
# echo 0 > run
# echo 0 > polarity
# echo 20000000 > period
# echo 1000000 > duty
# echo 1 > run

  - Note that the value for the @ sign is different for each user

3. Move servo

# echo 2000000 > duty

4. Turn off servo

# echo 0 > run

Troubleshooting

1. When trying to manually control the servo motor via CLI command in the user space, it does not move!

- There is a minimum and maximum limit for the duty at which the servo motor can move to.
If the number for the **duty** is currently set higher than the maximum limit (2400000), or lower than (600000), then it does not move. (This applies to both left/right, up/down)

- Try setting the duty to be within the range of 600000 and 2400000

2. When we have the frames being taken in “.ppm” format, we spend a lot of time converting the pictures formats so that we can pass it by socket.io and display them on webpage.

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**Cape Expansion Headers**

![Cape Expansion Headers Diagram](http://rabbit-note.com/2014/08/23/beaglebone-black-power-meter-hard/)