RaspiCam Documentation

This document describes the use of the three Raspberry Pi camera applications as of May 2013.

There are three applications provided, raspistill, raspivid and raspistillyuv. raspistill and raspistillyuv are very similar and are intended for capturing images, raspivid is for capturing video.

All the applications are command line driven, written to take advantage of the mmal API which runs over OpenMAX. The mmal API provides an easier to use system than that presented by OpenMAX. Note that mmal is a Broadcom specific API used only on Videocore 4 systems.

The applications use up to three OpenMAX(mmal) components - camera, preview and encoder. All applications use the camera component, raspistill uses the Image Encode component, raspivid uses the Video Encode component and raspistillyuv does not use an encoder, and sends its YUV output direct from camera component to file.

The preview display is optional, but can be used full screen or directed to a specific rectangular area on the display.

In addition it is possible to omit the filename option, in which case the preview is displayed but no file is written, or to redirect all output to stdout.

Command line help is available by typing just the application name in on the command line.

Common Command line Options

Preview Window

--preview,   -p   Preview window settings <'x,y,w,h'>

Allows the user to define the size and location on the screen that the preview window will be placed. Note this will be superimposed over the top of any other windows/graphics.

--fullscreen,   -f   Fullscreen preview mode

Forces the preview window to use the whole screen. Note that the aspect ratio of the incoming image will be retained, so there may be bars on some edges.

--nopreview,   -n,   Do not display a preview window

Disables the preview window completely. Note that even though the preview is disabled, the camera will still be producing frames, so will be using power.

Camera Control Options

--sharpness,   -sh   Set image sharpness (-100 to 100)

Set the sharpness of the image, 0 is the default.

--contrast,   -co   Set image contrast (-100 to 100)

Set the contrast of the image, 0 is the default

--brightness,   -br   Set image brightness (0 to 100)
Set the brightness of the image, 50 is the default. 0 is black, 100 is white.

--saturation,   -sa   Set image saturation (-100 to 100)

set the colour saturation of the image. 0 is the default.

--ISO,   -ISO Set capture ISO

Not yet implemented

--vstab,   -vs   Turn on video stabilisation

In video mode only, turn on video stabilisation.

--ev,   -ev   Set EV compensation

Set the EV compensation of the image. Range is -10 to +10, default is 0.

--exposure,   -ex   Set exposure mode

Possible options are:

```
off
auto              Use automatic exposure mode
night             Select setting for night shooting
nightpreview
backlight         Select setting for back lit subject
spotlight
sports            Select setting for sports (fast shutter etc)
snow              Select setting optimised for snowy scenery
beach             Select setting optimised for beach
verylong          Select setting for long exposures
fixedfps,         Constrain fps to a fixed value
antishake         Antishake mode
fireworks         Select settings
```

Note that not all of these settings may be implemented, depending on camera tuning.

--awb,   -awb Set Automatic White Balance (AWB) mode

```
off               Turn off white balance calculation
auto              Automatic mode (default)
sun               Sunny mode
cloud             Cloudy mode
shade             Shaded mode
tungsten          Tungsten lighting mode
fluorescent       Fluorescent lighting mode
incandescent      Incandescent lighting mode
flash             Flash mode
horizon           Horizon mode
```

--imxfx,   -ifx Set image effect

Set an effect to be applied to the image

```
none              NO effect (default)
negative          Negate the image
```

```
solarise         Solarise the image
posterize        Posterise the image
whiteboard       Whiteboard effect
blackboard       Blackboard effect
sketch           Sketch style effect
denoise          Denoise the image
emboss           Emboss the image
oilpaint         Apply an oil paint style effect
hatch            Hatch sketch style
gpen
pastel           A pastel style effect
watercolour      A watercolour style effect
film             Film grain style effect
blur             Blur the image
saturation       Colour saturate the image
colourswap       Not fully implemented
washedout        Not fully implemented
posterise        Not fully implemented
colourpoint      Not fully implemented
colourbalance    Not fully implemented
cartoon          Not fully implemented
```

--colfx,   -cfx Set colour effect <U:V>

The supplied U and V parameters (range 0 to 255) are applied to the U and Y
channels of the image. For example, --colfx 128:128 should result in a
monochrome image.

--metering, -mm Set metering mode

Specify the metering mode used for the preview and capture

```
average          Average the whole frame for metering.
spot             Spot metering
backlit          Assume a backlit image
matrix           Matrix metering
```

--rotation,   -rot Set image rotation (0-359)

Sets the rotation of the image in viewfinder and resulting image. This can take
any value from 0 upwards, but due to hardware constraints only 0, 90, 180 and
270 degree rotations are supported.

--hflip,   -hf   Set horizontal flip

Flips the preview and saved image horizontally.

--vflip,   -vf   Set vertical flip

Flips the preview and saved image vertically.

Application specific settings
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raspistill
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```
--width,    -w          Set image width <size>
--height,   -h          Set image height <size>
--quality,  -q          Set jpeg quality <0 to 100>
```

Quality 100 is almost completely uncompressed. 75 is a good all round value

--raw,   -r   Add raw bayer data to jpeg metadata

This option inserts the raw Bayer data from the camera in to the JPEG metadata

--output   -o   Output filename <filename>.

Specify the output filename. If not specified, no file is saved. If the filename is '-', then all output is sent to stdout.

--verbose, -v   Output verbose information during run

Outputs debugging/information messages during the program run.

--timeout, -t   Time before takes picture and shuts down.

The program will run for this length of time, then take the capture (if output is specified). If not specified, this is set to 5 seconds

--timelapse,-tl   Timelapse mode.

The specific value is the time between shots in milliseconds. Note you should specify %d at the point in the filename where you want a frame count number to appear. e.g.

     -t 30000 -tl 2000 -o image%d.jpg

will produce a capture every 2 seconds, over a total period of 30s, named image1.jpg, image2.jpg..image15.jpg.

--thumb,   -th   Set thumbnail parameters (x:y:quality)

Allows specification of the thumbnail image inserted in to the JPEG file. If not specified, defaults are a size of 64x48 at quality 35.

--demo,   d   Run a demo mode <milliseconds>

This options cycles through range of camera options, no capture is done, the demo will end at the end of the timeout period, irrespective of whether all the options have been cycled. The time between cycles should be specified as a millisecond value.

--encoding, -e   Encoding to use for output file

Valid options are jpg, bmp, gif and png. Note that unaccelerated image types (gif, png, bmp) will take much longer to save than JPG which is hardware accelerated. Also note that the filename suffix is completely ignored when encoding a file.

--exif,   -x   EXIF tag to apply to captures (format as 'key=value')

Allows the insertion of specific exif tags in to the JPEG image. You can have up to 32 exif tge entries. This is useful for things like adding GPS metadata. For example, to set the Longitude

     --exif GPS.GPSLongitude=5/1,10/1,15/100

would set the Longitude to 5degs, 10 minutes, 15 seconds. See exif documentation for more details on the range of tags available; the supported tags are as

follows.

IFD0.<   or
IFD1.<
ImageWidth, ImageLength, BitsPerSample, Compression, PhotometricInterpretation,
ImageDescription, Make, Model, StripOffsets, Orientation, SamplesPerPixel,
RowsPerString, StripByteCounts, Xresolution, Yresolution, PlanarConfiguration,
ResolutionUnit, TransferFunction, Software, DateTime, Artist, WhitePoint,
PrimaryChromaticities, JPEGInterchangeFormat, JPEGInterchangeFormatLength,
YcbCrCoefficients, YcbCrSubSampling, YcbCrPositioning, ReferenceBlackWhite,
Copyright>

EXIF.<
ExposureTime, FNumber, ExposureProgram, SpectralSensitivity,   a
ISOSpeedRatings, OECF, ExifVersion, DateTimeOriginal, DateTimeDigitized,
ComponentsConfiguration, CompressedBitsPerPixel, ShutterSpeedValue,
ApertureValue, BrightnessValue, ExposureBiasValue, MaxApertureValue,
SubjectDistance, MeteringMode, LightSource, Flash, FocalLength, SubjectArea,
MakerNote, UserComment, SubSecTime, SubSecTimeOriginal, SubSecTimeDigitized,
FlashpixVersion, ColorSpace, PixelXDimension, PixelYDimension, RelatedSoundFile,
FlashEnergy, SpacialFrequencyResponse, FocalPlaneXResolution,
FocalPlaneYResolution, FocalPlaneResolutionUnit, SubjectLocation, ExposureIndex,
SensingMethod, FileSource, SceneType, CFAPattern, CustomRendered, ExposureMode,
WhiteBalance, DigitalZoomRatio, FocalLengthIn35mmFilm, SceneCaptureType,
GainControl, Contrast, Saturation, Sharpness, DeviceSettingDescription,
SubjectDistanceRange, ImageUniqueID>

GPS.<
GPSVersionID, GPSLatitudeRef, GPSLatitude, GPSLongitudeRef, GPSLongitude,
GPSAltitudeRef, GPSAltitude, GPSTimeStamp, GPSSatellites, GPSStatus,
GPSMeasureMode, GPSDOP, GPSSpeedRef, GPSSpeed, GPSTrackRef, GPSTrack,
GPSImgDirectionRef, GPSImgDirection, GPSMapDatum, GPSDestLatitudeRef,
GPSDestLatitude, GPSDestLongitudeRef, GPSDestLongitude, GPSDestBearingRef,
GPSDestBearing, GPSDestDistanceRef, GPSDestDistance, GPSProcessingMethod,
GPSAreaInformation, GPSDateStamp, GPSDifferential>

EINT.<
InteroperabilityIndex, InteroperabilityVersion, RelatedImageFileFormat,
RelatedImageWidth, RelatedImageLength>

Note that a small subset of these tags will be set automatically by the camera
system, but will be overridden by any exif options on the command line.

raspivid
========

--width,   -w   Set image width <size>

Width of resulting video. This should be between 64 and 1920.

--height,   -h   Set image height <size>

Height of resulting video. This should be between 64 and 1080.

--bitrate, -b   Set bitrate.

Use bits per second, so 10MBits/s would be -b 10000000. For H264, 1080p a high
quality bitrate would be 15Mbits/s or more.

--output   -o   Output filename <filename>.

Specify the output filename. If not specified, no file is saved. If the filename is '-', then all output is sent to stdout.

```
--verbose,  -v          Output verbose information during run
```

Outputs debugging/information messages during the program run.

```
--timeout,  -t          Time before takes picture and shuts down.
```

The program will run for this length of time, then take the capture (if output is specified). If not specified, this is set to 5seconds

```
--demo,     d           Run a demo mode <milliseconds>
```

This options cycles through range of camera options, no capture is done, the demo will end at the end of the timeout period, irrespective of whether all the options have been cycled. The time between cycles should be specified as a millisecond value.

```
--framerate,     -fps  Specify the frames per second to record
```

At present, the minimum frame rate allowed is 2fps, the maximum is 30fps. This is likely to change in the future.

```
--penc,     -e    Display preview image *after* encoding
```

Switch on an option to display the preview after compression. This will show any compression artefacts in the preview window. In normal operation, the preview will show the camera output prior to being compressed. This option is not guaranteed to work in future releases.

Examples
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Still captures

By default, captures are done at the highest resolution supported by the sensor. This can be changed using the -w and -h command line options.

Taking a default capture after 2s (note times are specified in milliseconds) on viewfinder, saving in image.jpg

```
raspistill -t 2000 -o image.jpg
```

Take a capture at a different resolution.

```
raspistill -t 2000 -o image.jpg -w 640 -h 480
```

Now reduce the quality considerably to reduce file size

```
raspistill -t 2000 -o image.jpg -q 5
```

Force the preview to appear at coordinate 100,100, with width 300 and height 200 pixels.

```
raspistill -t 2000 -o image.jpg -p 100,100,300,200
```

Disable preview entirely

```
raspistill -t 2000 -o image.jpg -n
```

Save the image as a png file (lossless compression, but slower than JPEG). Note that the filename suffix is ignored when choosing the image encoding.

```
raspistill -t 2000 -o image.png –e png
```

Add some EXIF information to the JPEG. This sets the Artist tag name to Boris, and the GPS altitude to 123.5m. Note that if setting GPS tags you should set as a minimum GPSLatitude, GPSLatitudeRef, GPSLongitude, GPSLongitudeRef, GPSAltitude and GPSAltitudeRef.

```
raspistill -t 2000 -o image.jpg -x IFDO.Artist=Boris -x
GPS.GPSAltitude=1235/10
```

Set an emboss style image effect

```
raspistill -t 2000 -o image.jpg -ifx emboss
```

Set the U and V channels of the YUV image to specific values (128:128 produces a greyscale image)

```
raspistill -t 2000 -o image.jpg -cfx 128:128
```

Run preview ONLY for 2s, no saved image.

```
raspistill -t 2000
```

Take timelapse picture, one every 10 seconds for 10 minutes (10 minutes = 600000ms), named image_number_1_today.jpg, image_number_2_today.jpg onwards.

```
raspistill -t 600000 -tl 10000 -o image_num_%d_today.jpg
```

Take a picture and send image data to stdout

```
raspistill -t 2000 -o -
```

Take a picture and send image data to file

```
raspistill -t 2000 -o - > my_file.jpg
```


Video Captures

Image size and preview settings are the same as for stills capture. Default size for video recording is 1080p (1920x1080)

Record a 5s clip with default settings (1080p30)

```
raspivid -t 5000 -o video.h264
```

Record a 5s clip at a specified bitrate (3.5MBits/s)

```
raspivid -t 5000 -o video.h264 -b 3500000
```

Record a 5s clip at a specified framerate (5fps)

```
raspivid -t 5000 -o video.h264 -f 5
```

Encode a 5s camera stream and send image data to stdout

```
raspivid -t 5000 -o -
```

Encode a 5s camera stream and send image data to file

```
raspivid -t 5000 -o - > my_file.h264
```