

Re: Need help in converting YUV to RGB using OV7620

Source: <http://coding.derkeiler.com/Archive/General/comp.arch.embedded/2006-01/msg00561.html>

- *From:* "nuky8181" <k2skate2003@xxxxxxxx>
 - *Date:* Mon, 16 Jan 2006 01:24:21 -0600
-

>First step on something like this FORGET colour, see if you can create
the
>correct Y image for a monochrome image. Once you have that you know you
>have the correct clocking arrangement on data and you are getting all
>the data.
>
>THEN consider doing colour conversion.
>
>>YUV data is obtained in the following way
>>clk 1 Y0 U0
>>clk 2 Y1 V1
>>clk 3 Y2 U2 etc
>
>No, the format is best described spatially as
>
> Y Y Y Y
> U U
> V V
>
>In other words
>
> Y0 Y1 Y2 Y3
> U0 U1
> V0 V1
>
>You cannot work out true RGB until 2nd Y and V has been acquired, so you
>get a 1 pixel delay to start with.
>
>>The format is 4:2:2 format thus to get RGB I need to do the following
>>Example,
>>To get RGB for 1st pixel, Y0 U0 and V1 is used in the computation
>>to get RGB for 2nd pixel, Y1 U0 and V1 is used
>
>For third pixel onwards you may have to use in your nomenclature
>
> RGB2 = Y2 U2 and V1
>or Y2 U2 and V3
>

Re: Need help in converting YUV to RGB using OV7620

You mentioned the way u get RGB2, would like to double check with u again.

Just to illustrate abit more cos I dont really understand the RGB2 section. Suppost the following,

Y0 Y1 Y2 Y3 Y4 Y5 Y6 Y7

U0 U1 U2 U3

V0 V1 V2 V3

Can I do the following,

RGB1 = Y0 U0 V0

RGB2 = Y1 U0 V0

RGB3 = Y2 U1 V1

RGB4 = Y3 U1 V1

>Part of your problem may be how you are indexing the U/V data and ending

>up with 2 U samples or 2 V samples being used.

>

Point noted. Will do a check on this. Thanks.

>>The formula given in the data sheet to get YUV was as followed

>>Y=0.59G +0.31R + 0.11B

>>U/Cr = 0.713(R-Y)

>>V/Cb = 0.594(B-r)

>

>That is how they are generated internally from the filter matrix on the

>sensor as if it was a true RGB source conversion from

>

> Y = 0.299R' + 0.587G' + 0.114B'

> Cb = -0.172R' - 0.339G' + 0.511B' + 128

> Cr = 0.511R' - 0.428G' + 0.083B' + 128

>

>>I used matlab to get the conversion from YUV to RGB in the following

>>R = Y + 1.4025[U-128]

>>G = 0.983*Y + 0.7369[U-128] - 0.3306[V-128]

>>B = Y - 1.773[V-128]

>

>I don't know how you calculated that and whether you RGB has been

>gamma corrected or not but those figures are plain wrong.

Hm... I did not do any gamma correction but basically I just convert the formula given in the datasheet to matrices and then did a inverse matrices to get the formula.

>

>For YUV to gamma corrected RGB is (assumes U and V are SIGNED values)

>

> R' = Y + 1.140V

> G' = Y - 0.395U - 0,581V

> B' = Y + 2.032U

Re: Need help in converting YUV to RGB using OV7620

Re: Need help in converting YUV to RGB using OV7620

>
>That is true for PAL/NTSC/SECAM
>
>For 601 standard YCbCr to RGB gamma corrected the standard equations
>are
> $R' = Y + 1.371(Cr - 128)$
> $G' = Y - 0.698(Cr - 128) - 0,336(Cb - 128)$
> $B' = Y + 1.732(Cb - 128)$
>
>That is for 16–235(240) range signals, the multipliers are larger for
0–255
>range data for a start Y becomes $1,164(Y - 16)$, with all sorts of extra
>saturation, under/overflow logic as well.

Thanks for the two formula before. Will give it a try after the U and V
issue. I notice that in the Data sheet the following sentence

$$Y = 0.59G + 0.31R + 0.11B$$

$$U = R - Y$$

$$V = B - Y$$

or

$$Y = 0.59G + 0.31R + 0.11B$$

$$Cr = 0.713(R - Y)$$

$$Cb = 0.564(B - Y)$$

It sort of give me the impression that $Cr = U$ and $V = Cb$ but i found in
www.fourcc.org that $Cr = V$ and $U = Cb$. May I know which is the correct
one?

>
>The differences are not even explained by a typo in the message.
>
>>The 128 was include to shift U and V from the range 16 – 240 to
>>–112 – 112.
>
>I would check that you are using true signed variables for the
conversion
>and ensure with test data you
>
>>What I did was get the YUV data using DSPIC30F6012 and transfer it to
>>visual basic and use the RGB formula obtain above to get RGB but I
never
>>seem to get it. the result is always a green image regardless the
colour
>>of the image taken.
>
>Green images usually suggest that you have data shorts/opens or
incorrect
>clocking of data. It more than anything suggests to me that either there
is
>NO U/V data as (green is mainly Y component) or your U/V data port has

Re: Need help in converting YUV to RGB using OV7620

Re: Need help in converting YUV to RGB using OV7620

lost

>a high order bit (one or more of D5 to D7).

I have check for shorts and open. I believe I am not getting the wrong data due to the clocking because I manage to get Y data correctly and can display grey scale image but still checking if I am getting all U or V.

>

>>I have check that there is no data corruption during transfer and is now

>>really stuck. I have also tried other forumla found in other website where

>>one of which is microsoft msdn. Still, no avil.

>

>How have you checked the data transfer?

>Have you checked for shorts/opens from pins to pins, all the way through?

>

>If one or more of D5 to D7 is permanently high or low your results will be

>skewed.

>

My friend prompted that data sent from the camera to the laptop could be lost so I transfer fix data and what I did is indeed what I send.

>Have you taken images of a FLAT colour at saturation to check you data

>conversion, or as another poster has suggested fed a colour bars data

>set into your algorithm.

My algorithm did not manage to get what John say suggested. Even the two formula you gave manage to get the value he has given.

Thanks for the advice given Paul.

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• **References:**

- ◆ **[Need help in converting YUV to RGB using OV7620](#)**

◇ *From:* nuky8181

- ◆ **[Re: Need help in converting YUV to RGB using OV7620](#)**

◇ *From:* Paul Carpenter

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- Previous by thread: **[Re: Need help in converting YUV to RGB using OV7620](#)**
- Next by thread: **[Master LIN node with FS HC08GZ60](#)**
- Index(es):
 - ◆ **[Date](#)**

Re: Need help in converting YUV to RGB using OV7620

◆ *Thread*