

Re- and Up-Sampling Method Using Interpolation

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Abstract. Recently, flat panel display has become common than cathode-ray tube in the large display market. The proposed system uses downsampling and upsampling approach in YCbCr decomposition. Due to the fact that human eyes are more sensitive to the luminance part and less sensitive to the chrominance parts, we can reduce the resolution of chrominance components without quality degradation.

Keywords: Upsampling, downsampling, flat panel display.

1 Introduction

The YCbCr is a sort of color spaces adopted as a part of the color image pipeline in video and digital photography systems [1]. Y is the luminance part and Cb and Cr are chrominance parts, blue-difference and red-difference, respectively [2]. The luminance part stands for the light intensity which is encoded based on gamma corrected RGB components. Human eyes are more sensitive to the luminance part and less sensitive to the chrominance parts, therefore we prefer to downsample chrominance parts instead of luminance part [3-6].

2 Proposed method

Figure 1 shows the proposed method. The proposed system works as follows:

- Step 1: Obtain gamma corrected RGB image
- Step 2: Transform RGB image into YCbCr image
- Step 3: YCbCr decomposition
- Step 4: Downsample Cb and Cr components
- Step 5: Merge original Y and downsampled Cb and Cr components
- Step 6: Transform YCbCr and obtain RGB image

The `rgb2ycbcr` commands convert the original RGB image into the maps of Y, Cb, Cr color space. The opposite process of `rgb2ycbcr` is `ycbcr2rgb`.

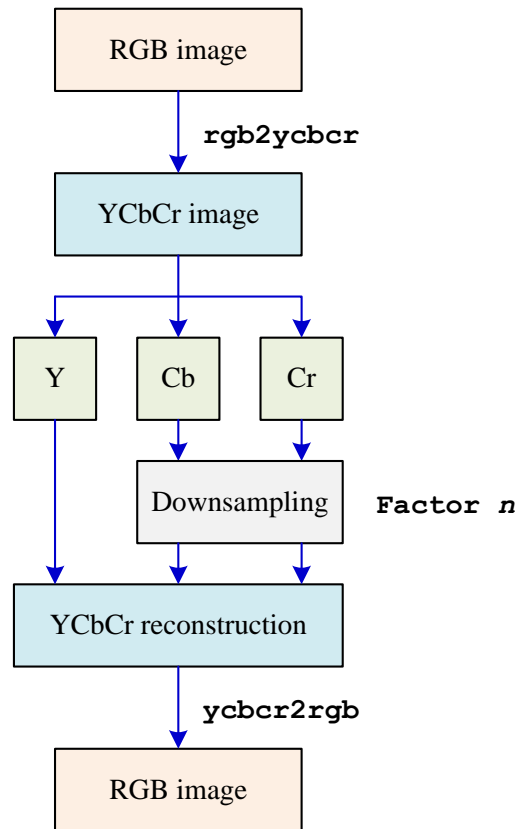


Fig.1. Flowchart of the proposed method.

3 Simulation results

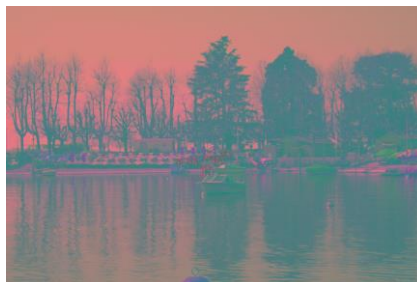
Figure 2 shows the result images of the presented system. Figure 2(a) shows the original image. Figures 2(b) and 2(c) are reconstructed RGB and YCbCr images with factor $n=2$. Figures Figs. 2(d) and 2(e) are restored images with factor $n=8$, and Figs. 2(e) and 2(f) are reconstructed images with factor $n=16$.



(a)



(b)



(c)



(d)



(e)



(f)



(g)

Fig. 2. Test #10 image of Zahra set: (a) original image, (b) RGB image with $n=2$, (c) YCbCr image with $n=2$, (d) RGB image with $n=8$, (e) YCbCr image with $n=8$, (f) RGB image with $n=16$, and (g) YCbCr image with $n=16$.

4 Conclusions

The presented method adopted downsampling and upsampling method in YCbCb decomposition. It can be found that the chrominance component is not important for human perception.

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