

Homework Assignment #1

Due Friday, Sept. 25, 2015

1. Why was the field rates of NTSC and PAL standards were chosen to be the same as the AC power frequencies?
2. We know that human visual system has higher resolution horizontally than vertically. Why is the conversion from the YCbCr 4:4:4 format to the YCbCr 4:2:2 format performed by sub-sampling Cb and Cr horizontally, not vertically? For the same reason, why was the YCbCr 4:1:1 format even considered since the YCbCr 4:2:0 formats are better in term of the horizontal resolution for the chrominance components?
3. Find a few color images in the (R, G, B) format.
 - a) Calculate the correlations of (R, G), (R, B), and (G, B). The correlation formula is given as follows, using (R, G) as an example:
$$C(R,G) = \sum(r_i - r)(g_i - g) / \sqrt{\sum(r_i - r)^2 \sum(g_i - g)^2}$$
 - b) Find a matrix to convert (R, G, B) to (Y, Cb, Cr).
 - c) Calculate the correlations of (Y, Cb), (Y, Cr), and (Cb, Cr).
 - d) Discuss the results of a) and c).