

Demosaic 系列五: AI

显然 AI 是有用的, 但是显然 AI 是过于复杂的。

一、NAT

Color Demosaicking by Local Directional Interpolation and Nonlocal Adaptive Thresholding, Unknown 2011, Lei Zhang, 香港理工大学

引用次数为 507 (截至 2024.02)。张磊博士的文章, 引用次数很高, 效果也还行, 但是因为是非线性所以时间上感觉会长很多, 所以实用价值存疑。

本质思想就是用 NLM 的方法去解决 Demosaic, 貌似也是先算色差, 然后在色差图上去求解。

二、ECC

EXPLOITATION OF INTER-COLOR CORRELATION FOR COLOR IMAGE, ICIP 2013, Jaiswal, HKUST

引用次数 14 (2024.02), 论文太花里胡哨了, 本质上就是融合【利用低通滤波预测】和【利用色差插值预测】这两种方法。

论文就是用了许多公式, 最后结果就是融合两种方法效果会更好, 但是他用的这两个方法都是最朴素的方法, 后续许多改进方法, 可能论文的公式就不适用了。

此外论文和 RI 方法一样, 只是对 R 和 B 进行提升, G 是认为 GBTF 预测的 G 足够准确。

3.4. Algorithm steps

The main steps of the algorithm are as follows:

1. Interpolate the green component (\hat{G}) first by some interpolation process. In our experiment we propose to use method [9] to get the \hat{G} component.
2. To interpolate the missing samples of a block (\hat{r}) in red component, its corresponding \hat{r}_{CDI} and \hat{r}_{LPF} are computed.
3. Due to unavailability of original block (r), we use the resultant image (\hat{r}) obtained by the method [9] as an estimation of original block (r). Thus the weighted parameters (w_1, w_2) can be calculated from (17). Using the weighted parameters, \hat{r} can be estimated from (14).
4. Repeat step 2 and step 3 to reconstruct the whole image.

$$d = r - \hat{r} = r - (w_1 \hat{r}_{LPF} + w_2 \hat{r}_{CDI}) = w_1 d_{LPF} + w_2 d_{CDI} \quad (15)$$

$$\begin{cases} w_1 = E[d_{CDI}(d_{CDI} - d_{LPF})]/E[(d_{CDI} - d_{LPF})^2], \\ w_2 = E[d_{LPF}(d_{LPF} - d_{CDI})]/E[(d_{CDI} - d_{LPF})^2] \end{cases}$$

$$\hat{r} = w_1 \hat{r}_{LPF} + w_2 \hat{r}_{CDI}$$

The simplest way to demosaicking is to apply low pass filter to each channel independently. Using the same LPF (as used in (2)), the interpolated red component (\hat{R}_{LPF}) is given by

$$\hat{R}_{LPF} = \zeta\{R_a\} = R_l \quad (4)$$

As discussed in previous section, the interpolated \hat{R}_{CDI} from (3) can be written as:

$$\hat{R}_{CDI} = R_l - \hat{G}_l + \hat{G} = R_l + \hat{G}_h \quad (7)$$