UVNR-UV noise reduce

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202308

咖啡众筹

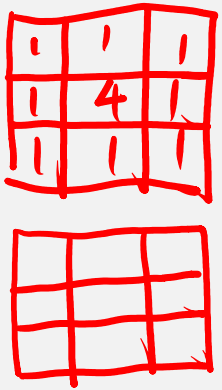
勘误

01. “NR-中值滤波、多级中值滤波、多级中值混合滤波、加权中值滤波、中值有理混合滤波”

视频10：00左右关于WMF和CWMF的讲解

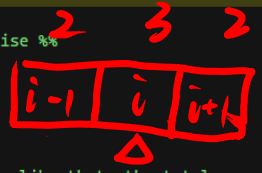
https://ww2.mathworks.cn/matlabcentral/fileexchange/29386-weighted-median-filter 当前参考

Center Weighted Median Filters and Their Applications to Image Enhancement 原始论文参考



```
%%   MANISH KUMAR SHARMA, cdac-noida, 2010
%% Weighted median filter on a image with salt & pepper noise %%
I = imread('manish.jpg');
I = double(I)
Z = imnoise(I,'salt & pepper',0.02);   % adding Noise
a = double(Z);
b = a;
W = [1,1,1; 1,4,1; 1,1,1]/12    % the values should taken like that, the total sum of values of filter
                                % is divided by there sum and value should be equal to 1.
[row col] = size(a);
for x = 2:1:row-1
    for y = 2:1:col-1
    %% To make a 3x3 weighted mask into a 1x9 mask
    a1 = [W(1)*a(x-1,y-1) W(2)*a(x-1,y) W(3)*a(x-1,y+1) ...
          W(4)*a(x,y-1) W(5)*a(x,y) W(6)*a(x,y+1)...
          W(7)*a(x+1,y-1) W(8)*a(x+1,y) W(9)*a(x+1,y+1)];
    a2 = sort(a1);
    med = a2(5) % the 5th value is the weighted median
    b(x,y) = med
end

end
figure(1); imshow(uint8(Z))
figure(2); imshow(uint8(b))
```



Consider the WM filter with weights

$$\left\{h(s,t)|(s,t)\in W,\ \sum_{(s,t)\in W} h(s,t)=c\right\}$$

with c an odd integer greater than or equal to the window size. In obtaining the output $Y(i,j)$ the WM filter generates $h(s,t)$ copies of $X(i-s,j-t)$ for each $(s,t)\in W$, a total of c sample values. Then the median value of the c samples is taken. Thus $Y(i,j)$ is represented as

$$Y(i,j)=\text{median}\{h(s,t)\text{ copies of }s,j-t)|(s,t)\in W\}. \quad (2)$$

$$\begin{cases} X_{ij}(a;2L+1), \\ X_{ij}(2L+2-a;2L+1), \\ X(i,j), \end{cases}$$

WM filter with $W=$ s $\{h(-1,0),h(0,0),h(1,0)\}$ iven by

$(i-1,j),X(i,j),X(i$ $,X(i+1,j),X(i+$ eight $h(0,0)=2K+$ is called the CWM

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勘误

知乎Jesse

01. “NR-中值滤波、多级中值滤波、多级中值混合滤波、加权中值滤波、中值有理混合滤波”关于WMF和CWMF的讲解

编辑器 - G:\Fred\ISP\ISPAlgorithmStudy\BNR\src\MRHF.m

MRHF.m

```
25 -    PaddedImg = padarray(I,[1, 1],'symmetric','both
26
27 -    h = 2;
28 -    k = 0.01;
29
30 -    tic
31 -    for i = 1: m
32 -        for j = 1: n
33 -            roi = PaddedImg(i:i+2, j:j+2);
34 -            median_HV = median([roi(1,2), roi(2,1),
35 -            median_diag = median([roi(1,1), roi(1,3
36 -            CWMF = median([roi(1,2), roi(2,1), roi(
37
38 -            DenoisedImg(i, j) = CWMF + (median_HV +
39 -        end
40 -    end
41 -    toc
42 -    figure();
43 -    imshow(uint8(DenoisedImg));
44 -    title('denoise file');
```

MRHF.m

```
21 -    title('noise file');
22 -    [m,n] = size(I_noise);
23
24 -    DenoisedImg = zeros(m,n);
25 -    PaddedImg = padarray(I,[1, 1],'symmetric','both');
26
27 -    h = 2;
28 -    k = 0.01;
29
30 -    tic
31 -    for i = 1: m
32 -        for j = 1: n
33 -            roi = PaddedImg(i:i+2, j:j+2);
34 -            median_HV = median([roi(1,2), roi(2,1), roi(2,2), roi(2,3), roi(3,2)]);
35 -            median_diag = median([roi(1,1), roi(1,3), roi(2,2), roi(3,1), roi(3,3)]);
36 -            n = [1 1 1 1 3 1 1 1 1];
37 -            wRoi = repelem(roi(:)', n);
38 -            CWMF = median(wRoi);
39
40 -            DenoisedImg(i, j) = CWMF + (median_HV + median_diag - 2 * CWMF) / (h + k * (median_HV - median_diag));
41 -        end
42 -    end
43 -    toc
44 -    figure();
45 -    imshow(uint8(DenoisedImg));
46 -    title('denoise file');
47 -    b = medfilt2(I_noise,[3,3]);
```

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勘误

知乎Jesse

02. “NR-中值滤波、多级中值滤波、多级中值混合滤波、加权中值滤波、中值有理混合滤波”

视频11：20左右关于MRHF的讲解

Median-rational hybrid filters | IEEE Conference Publication | IEEE Xplore 当前参考文献

$$y(n) = \Phi_2(n) + \frac{\sum_{i=1}^{3} \alpha_i \Phi_i(n)}{h + k(\Phi_1(n) - \Phi_3(n))^2} \qquad (1)$$

```
for i = 1: m
    for j = 1: n
        roi = PaddedImg(i:i+2, j:j+2);
        median_HV = median([roi(1,2), roi(2,1), roi(2,2), roi(2,3), roi(3,2)]);
        median_diag = median([roi(1,1), roi(1,3), roi(2,2), roi(3,1), roi(3,3)]);
        n = [1 1 1 1 3 1 1 1 1];
        wRoi = repelem(roi(:)', n);
        CWMF = median(wRoi);

        % refer to "Noise Reduction Techniques for Bayer-Matrix Images"
        DenoisedImg(i, j) = CWMF + (median_HV + median_diag - 2 * CWMF) / (h + k * (median_HV - median_diag));

        % refer to "MEDIAN-RATIONAL HYBRID FILTERS Laxhar"
        % DenoisedImg(i, j) = CWMF + (median_HV + median_diag - 2 * CWMF) / (h + k * (median_HV - median_diag)^2);

        % Computational acceleration through L1 distance
        % DenoisedImg(i, j) = CWMF + (median_HV + median_diag - 2 * CWMF) / (h + k * abs(median_HV - median_diag));
    end
end
```

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勘误

速冻苹果 LV3
我就说你这样

B站速冻苹果

03. “ISP_DEMOSAICKING”

视频30：00左右关于色差法的插值

《单芯片CMOS图像传感器数字系统的设计与实现》

“An Adaptive Color Filter Array Interpolation Algorithm for Digital Camera”

算，

$$g_{i,j}=\frac{(G_{i,j-1}+G_{i,j+1})}{2}+\frac{(2R_{i,j}-R_{i,j-2}-R_{i,j+2})}{4}\quad \text{if } \Delta H_{i,j}<\Delta V_{i,j} \tag{3}$$

$$g_{i,j}=\frac{(G_{i-1,j}+G_{i+1,j})}{2}+\frac{(2R_{i,j}-R_{i-2,j}-R_{i+2,j})}{4}\quad \text{if } \Delta H_{i,j}>\Delta V_{i,j} \tag{4}$$

$$R_{m,n}=G_{m,n}+\frac{R_{m-1,n-1}+R_{m+1,n-1}+R_{m-1,n+1}+R_{m+1,n+1}-(G_{m-1,n-1}+G_{m+1,n-1}+G_{m-1,n+1}+G_{m+1,n+1})}{4}$$

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01 产生原因

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彩噪产生原因

Assuming a sensor with a color filter array (CFA) in a typical color imaging processing pipeline, the sensor analog gains and possibly other digital gains must be adjusted as a result of color correction, white balance and other steps which may account for unequal sensor sensitivity on the different channels. According to the propagation of error formula, signal variance increases with the square root of the applied gain, thus regardless of the analog or digital domain where such a gain adjustment is performed, the net effect is a different signal standard deviation on the various channels. After color interpolation, when sensor channels are correlated, the described mechanism gives rise to what it is referred to as chrominance noise. This is further amplified when a non-spatially adaptive color correction is applied, as noted by others in [1-4], to become large, perceptually periodic groupings of 15 to 25 pixels across. For completion and an in depth, low level discussion on the various physical sources of noise in an imaging system, the reader is referred to Janesik [5].

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02 UVNR校正方法

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$$C'_{b_0} = \frac{\sum_{n=-N_1}^{N_2} (C_{b_n} T_n)}{\sum_{n=-N_1}^{N_2} (T_n)}, \quad \text{(Eqn. 1)}$$

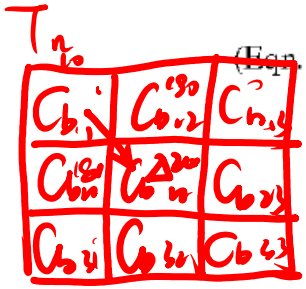
wherein: If $|C_{b_n} - C_{b_0}| + |C_{r_n} - C_{r_0}| > \Gamma$,

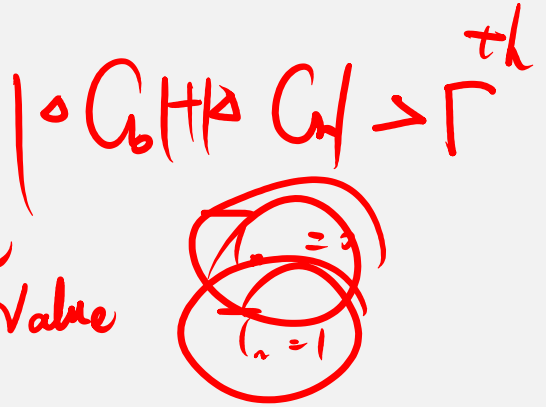
Then $T_n = 0$, Else $T_n = 1$.

$$C'_{r_0} = \frac{\sum_{n=-N_1}^{N_2} (C_{r_n} T_n)}{\sum_{n=-N_1}^{N_2} (T_n)}, \quad \text{(Eqn. 2)}$$

wherein: If $|C_{b_n} - C_{b_0}| + |C_{r_n} - C_{r_0}| > \Gamma$,

Then $T_n = 0$, Else $T_n = 1$.





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UVNR-STMicroelectronics专利 *IMAGE CHROMA NOISE REDUCTION*

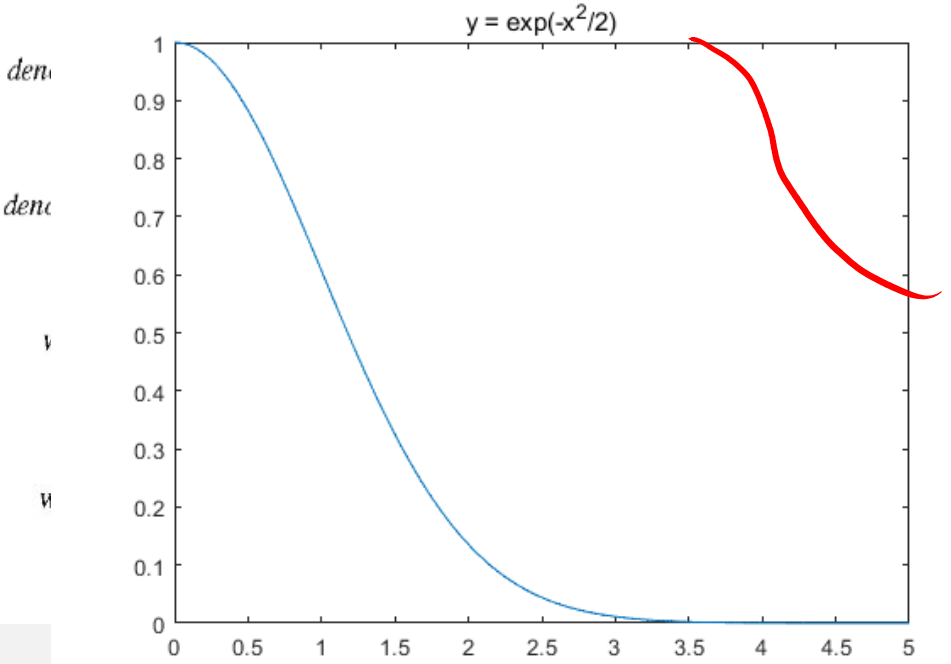
$$f(x) = e^{-\frac{1}{2}(\frac{x}{sigma})^2} \quad x \in [0, \text{max value}]$$

$$Cf = \begin{cases} DY & \text{if } DY = \min(DY, DCr, DCb) \\ \max(DY, DCr, DCb) & \text{otherwise} \end{cases}$$

$$DCr = \max_I(Cr) - \min_I(Cr)$$

$$DCb = \max_I(Cb) - \min_I(Cb)$$

$$DY = \max_I(Y) - \min_I(Y)$$



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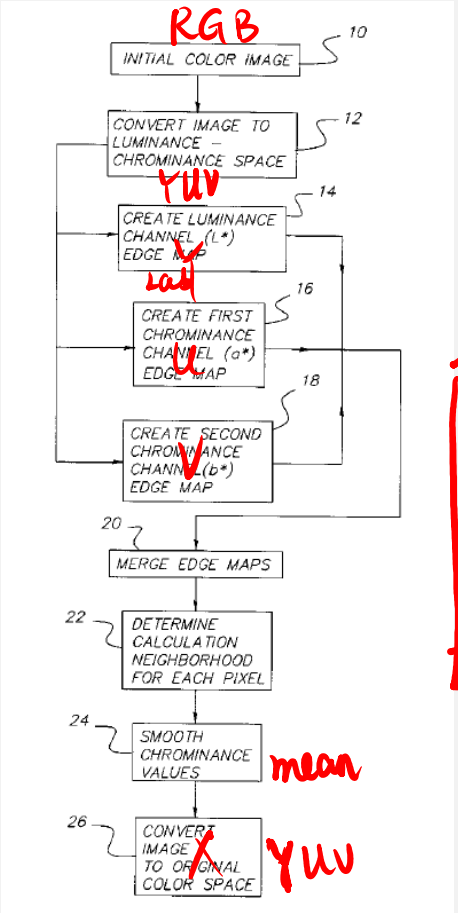
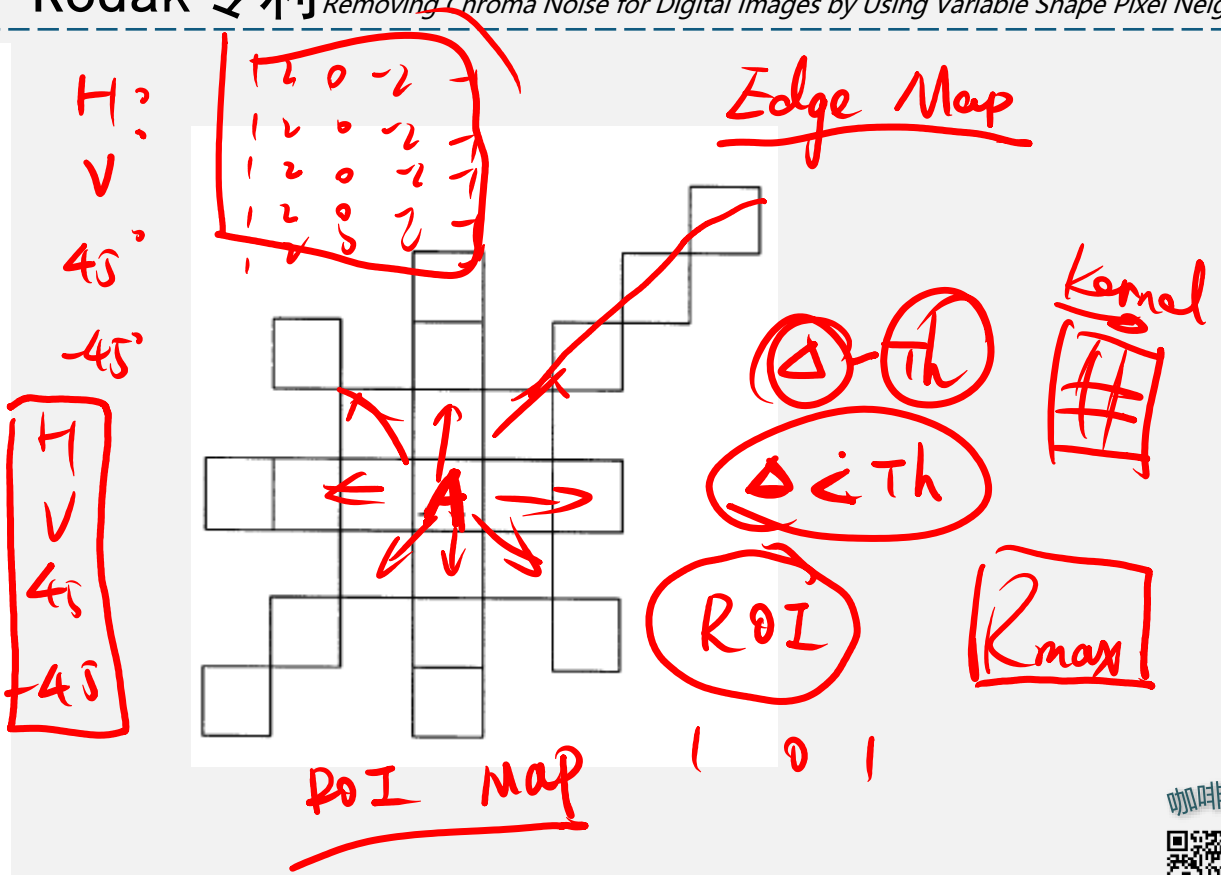
UVNR-Eastman Kodak专利

Removing Chroma Noise for Digital Images by Using Variable Shape Pixel Neighborho





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02 UVNR的实现

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https://gitee.com/wtzhu13

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See You!