

# OSPC - Supplementary Material

June 6, 2023

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**Algorithm 1** Camera Response Function

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1: Let  $window = 200$   $k = 1$ ,  $k_1 = 0.92$ ,  $k_2 = 1.08$ ,  $r_{max} = 0.1$ ,  $frame_L =$   
    $NULL$ ,  $frame_R = NULL$ ,  $database = NULL$ , and  $index = 0$   
2: for  $i = 1, 2, \dots, window$  do  
3:   Save current frame with exposure metadata value in  $database$   
4:    $index = index + 1$   
5:   if  $frame_L = NULL$  then  
6:     Set  $frame_L = database[1]$   
7:     Continue  
8:   end if  
9:   Set  $frame_R = database[index]$   
10:  while  $index \leq database_{length}$  do  
11:    if  $index + 1 \leq database_{length}$  then  
12:       $index = index + 1$   
13:    end if  
14:     $k = e_R/e_L$   
15:    if  $k \leq k_1$  OR  $k \geq k_2$  then  
16:      Extract and match SIFT features between pair  $frame_L$  and  
       $frame_R$   
17:      Remove outliers between found matches  
18:      for  $point = 1, 2, \dots$  do  
19:        Compute radial displacement  $disp$  between pair of points  
20:        if  $disp \leq r_{max}$  then  
21:          Add new row  $[1 - k, M_1 - k * M_2, M_1^2 - k * M_2^2]$  to the  
          matrix (Eq. 3)  
22:        end if  
23:      end for  
24:      Remove  $frame_L$  from  $database$   
25:      Set  $index = 1$ ,  $frame_L = database[1]$   
26:    end if  
27:  end while  
28: end for  
29: Solve for CRF parameters  $c_0$ ,  $c_1$ , and  $c_2$ 
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**Algorithm 2** Vignette

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1: Let  $window = 400$ ,  $offset = 30$ ,  $r_{min} = 0.2$ ,  $frame_L = NULL$ ,  
    $frame_R = NULL$ ,  $database = NULL$   
2: Save the first 30 frames in a list named database  
3: for  $i = 1, 2, \dots, window - offset$  do  
4:    $Frame_L = database[1]$   
5:    $Frame_R = database[offset]$   
6:   Extract and match SIFT features between pair  $Frame_L$  and  
    $Frame_R$   
7:   Remove outliers between found matches  
8:   for  $point = 1, 2, \dots$  do  
9:     Compute radial displacement  $disp$  between pairs of matched  
     points  
10:    if  $disp \geq r_{min}$  then  
11:      Add new row  $[R_1^2 - \psi R_2^2 \quad R_1^4 - \psi R_2^4 \quad R_1^6 - \psi R_2^6]$  to the matrix  
      (Eq. 13)  
12:      Add element  $\psi - 1$  to the right vector (Eq. 13)  
13:    end if  
14:  end for  
15:  Remove  $frame_L$  from database  
16:  Append the current frame to database  
17: end for  
18: Solve for Vignette parameters  $v1$ ,  $v2$ ,  $v3$ 
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