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APPENDIX

APPENDIX A

Program 01

The software use to simulate the Tetrahedral 12 and Whole space method.

```
%This is for Tetra12

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
S = input('give me LUT of SGB(scale255) to RGB(scale255) file wk1:\\','s')

IN= input('give me your Input file SGB(scale255) file wk1:\\','s')

%File for LUT %
         LoUp = wk1read(S);
      Row1 = length(LoUp);
   SGBindx = LoUp(:,1:3);

%%%%%%%%% retrive file name to write TIFF later %%%%%%%%%%%
IN(:,end-3:end)=[]                                        %
 S(:,end-3:end)=[]                                        %
%%%%%%%%% retrive file name to write TIFF later %%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

n01=1;,n02=1;,n03=1;,n04=1;,n05=1;,n06=1;,n07=1;,n08=1;,n09=1;,n10=1;,n11=1;,n12=1;,n1
3=1;,n14=1;

LUT01=[];,LUT02=[];,LUT03=[];,LUT04=[];,LUT05=[];,LUT06=[];,LUT07=[];,...
LUT08=[];,LUT09=[];,LUT10=[];,LUT11=[];,LUT12=[];,LUT13=[];

% factor of Overlap
F = 25;,P = 15;

for i=1:length(SGBindx)

    %%%%%%%%%%%%%%% part 01 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,1) > SGBindx(i,2)-F & SGBindx(i,2) > SGBindx(i,3)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT01(n01,:) = LoUp(i,:);, n01=n01+1;
    end
    if      SGBindx(i,1) > SGBindx(i,2)-F & SGBindx(i,2) > SGBindx(i,3)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT02(n02,:) = LoUp(i,:);, n02=n02+1;
    end
    %%%%%%%%%%%%%%% part 02 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,1) > SGBindx(i,3)-F & SGBindx(i,3) > SGBindx(i,2)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT03(n03,:) = LoUp(i,:);, n03=n03+1;
    end
    if      SGBindx(i,1) > SGBindx(i,3)-F & SGBindx(i,3) > SGBindx(i,2)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT04(n04,:) = LoUp(i,:);, n04=n04+1;
    end
    %%%%%%%%%%%%%%% part 03 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,3) > SGBindx(i,1)-F & SGBindx(i,1) > SGBindx(i,2)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT05(n05,:) = LoUp(i,:);, n05=n05+1;
    end
```

```
    if      SGBindx(i,3) > SGBindx(i,1)-F & SGBindx(i,1) > SGBindx(i,2)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT06(n06,:) = LoUp(i,:);, n06=n06+1;
    end
    %%%%%%%%%%%%%%% part 04 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,2) > SGBindx(i,1)-F & SGBindx(i,1) > SGBindx(i,3)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT07(n07,:) = LoUp(i,:);, n07=n07+1;
    end
    if      SGBindx(i,2) > SGBindx(i,1)-F & SGBindx(i,1) > SGBindx(i,3)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT08(n08,:) = LoUp(i,:);, n08=n08+1;
    end
    %%%%%%%%%%%%%%% part 05 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,2) > SGBindx(i,3)-F & SGBindx(i,3) > SGBindx(i,1)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT09(n09,:) = LoUp(i,:);, n09=n09+1;
    end
    if      SGBindx(i,2) > SGBindx(i,3)-F & SGBindx(i,3) > SGBindx(i,1)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT10(n10,:) = LoUp(i,:);, n10=n10+1;
    end
    %%%%%%%%%%%%%%% part 06 %%%%%%%%%%%%%%%%%

    if      SGBindx(i,3) > SGBindx(i,2)-F & SGBindx(i,2) > SGBindx(i,1)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) > 383-F
            LUT11(n11,:) = LoUp(i,:);, n11=n11+1;
    end
    if      SGBindx(i,3) > SGBindx(i,2)-F & SGBindx(i,2) > SGBindx(i,1)-F & SGBindx
(i,1)+SGBindx(i,2)+SGBindx(i,3) < 384+F
            LUT12(n12,:) = LoUp(i,:);, n12=n12+1;
    end
    %%%%%%%%%%%%%%% part 07 %%%%%%%%%%%%%%%%%

    if      ((SGBindx(i,1) > SGBindx(i,2)-P) & (SGBindx(i,1) < SGBindx(i,2)+P)) &...
            ((SGBindx(i,2) > SGBindx(i,3)-P) & (SGBindx(i,2) < SGBindx(i,3)+P)) &...
            ((SGBindx(i,1) > SGBindx(i,3)-P) & (SGBindx(i,1) < SGBindx(i,3)+P))
            LUT13(n13,:) = LoUp(i,:);, n13=n13+1;
    end


end

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Here, defind LUTcell array to keep all LUT data together
% for 'for' loop purpose, and defind Coefficient matrix to
% store the coeeficient of 4 order of 14 LUT and 3 chanal
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

if isempty(LUT01) | length(LUT01(:,1))<3, LUTcel{1,1,1} = LUT13;,else LUTcel
{1,1,1}=LUT01, end
if isempty(LUT02) | length(LUT02(:,1))<3, LUTcel{1,1,2} = LUT14;,else LUTcel
{1,1,2}=LUT02, end
if isempty(LUT03) | length(LUT03(:,1))<3, LUTcel{1,1,3} = LUT13;,else LUTcel
{1,1,3}=LUT03, end
if isempty(LUT04) | length(LUT04(:,1))<3, LUTcel{1,1,4} = LUT14;,else LUTcel
{1,1,4}=LUT04, end
if isempty(LUT05) | length(LUT05(:,1))<3, LUTcel{1,1,5} = LUT13;,else LUTcel
{1,1,5}=LUT05, end
if isempty(LUT06) | length(LUT06(:,1))<3, LUTcel{1,1,6} = LUT14;,else LUTcel
{1,1,6}=LUT06, end
if isempty(LUT07) | length(LUT07(:,1))<3, LUTcel{1,1,7} = LUT13;,else LUTcel
{1,1,7}=LUT07, end
if isempty(LUT08) | length(LUT08(:,1))<3, LUTcel{1,1,8} = LUT14;,else LUTcel
{1,1,8}=LUT08, end
if isempty(LUT09) | length(LUT09(:,1))<3, LUTcel{1,1,9} = LUT13;,else LUTcel
{1,1,9}=LUT09, end
if isempty(LUT10) | length(LUT10(:,1))<3, LUTcel{1,1,10} = LUT14;,else LUTcel
{1,1,10}=LUT10, end
if isempty(LUT11) | length(LUT11(:,1))<3, LUTcel{1,1,11} = LUT13;,else LUTcel
{1,1,11}=LUT11, end
```

```
if isempty(LUT12) | length(LUT12(:,1))<3, LUTcel{1,1,12} = LUT14;,else LUTcel
{1,1,12}=LUT12, end
if ~isempty(LUT13), LUTcel{1,1,13} = LUT13;,else,LUTcel{1,1,13} = [], end

 CoEff1=zeros(4,3,13);
 CoEff2=zeros(11,3,13);
 CoEff3=zeros(14,3,13);
 CoEff4=zeros(20,3,13);

%  start  %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

for i=1:13
temp = LUTcel{:,:,i};
    if ~isempty(temp)
    LUTt = LUTcel{:,:,i};   %CAREFUL for cell array use {...}
    SGBt = LUTt(:,1:3);
    RGBt = LUTt(:,4:6);

    RRGBt = RGBt(:,1);     %RRGB
    GRGBt = RGBt(:,2);     %GRGB
    BRGBt = RGBt(:,3);     %BRGB

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Here, Coefficient matrix                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        aR1 = zeros(4,1);
        aG1 = zeros(4,1);
        aB1 = zeros(4,1);

        aR2 = zeros(11,1);
        aG2 = zeros(11,1);
        aB2 = zeros(11,1);

        aR3 = zeros(14,1);
        aG3 = zeros(14,1);
        aB3 = zeros(14,1);

        aR4 = zeros(20,1);
        aG4 = zeros(20,1);
        aB4 = zeros(20,1);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% first order 04
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xa = cat(2,ones((length(LUTt(:,1,1))),1),SGBt);

aR1 = Xa\RRGBt
aG1 = Xa\GRGBt
aB1 = Xa\BRGBt

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% second order 11
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xb0 = ones((length(LUTt(:,1,1))),1);
Xb1 = SGBt(:,1);
Xb2 = SGBt(:,2);
Xb3 = SGBt(:,3);
Xb4 = [SGBt(:,1).*SGBt(:,2)];
Xb5 = [SGBt(:,2).*SGBt(:,3)];
Xb6 = [SGBt(:,1).*SGBt(:,3)];
Xb7 = SGBt(:,1).^2;
Xb8 = SGBt(:,2).^2;
Xb9 = SGBt(:,3).^2;
Xb10= [SGBt(:,1).*SGBt(:,2).*SGBt(:,3)];

Xb  = cat(2,Xb0,Xb1,Xb2,Xb3,Xb4,Xb5,Xb6,Xb7,Xb8,Xb9,Xb10);

aR2 = Xb\RRGBt;
aG2 = Xb\GRGBt;
aB2 = Xb\BRGBt;
```

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Third order 14
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

 Xc0 = ones((length(LUTt(:,1,1))),1);
 Xc1 = SGBt(:,1);
 Xc2 = SGBt(:,2);
 Xc3 = SGBt(:,3);
 Xc4 = [SGBt(:,1).*SGBt(:,2)];
 Xc5 = [SGBt(:,2).*SGBt(:,3)];
 Xc6 = [SGBt(:,1).*SGBt(:,3)];
 Xc7 = SGBt(:,1).^2;
 Xc8 = SGBt(:,2).^2;
 Xc9 = SGBt(:,3).^2;
 Xc10= [SGBt(:,1).*SGBt(:,2).*SGBt(:,3)];
 Xc11= SGBt(:,1).^3;
 Xc12= SGBt(:,2).^3;
 Xc13= SGBt(:,3).^3;

 Xc  = cat(2,Xc0,Xc1,Xc2,Xc3,Xc4,Xc5,Xc6,Xc7,Xc8,Xc9,Xc10,Xc11,Xc12,Xc13);

 aR3 = Xc\RRGBt;
 aG3 = Xc\GRGBt;
 aB3 = Xc\BRGBt;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Third order 20
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xd0 = ones((length(LUTt(:,1,1))),1);
Xd1 = SGBt(:,1);
Xd2 = SGBt(:,2);
Xd3 = SGBt(:,3);
Xd4 = [SGBt(:,1).*SGBt(:,2)];
Xd5 = [SGBt(:,2).*SGBt(:,3)];
Xd6 = [SGBt(:,1).*SGBt(:,3)];
Xd7 = SGBt(:,1).^2;
Xd8 = SGBt(:,2).^2;
Xd9 = SGBt(:,3).^2;
Xd10= [SGBt(:,1).*SGBt(:,2).*SGBt(:,3)];
Xd11= SGBt(:,1).^3;
Xd12= SGBt(:,2).^3;
Xd13= SGBt(:,3).^3;
Xd14= [SGBt(:,1).*(SGBt(:,2).^2)];
Xd15= [SGBt(:,2).*(SGBt(:,1).^2)];
Xd16= [SGBt(:,2).*(SGBt(:,3).^2)];
Xd17= [SGBt(:,3).*(SGBt(:,2).^2)];
Xd18= [SGBt(:,3).*(SGBt(:,1).^2)];
Xd19= [SGBt(:,1).*(SGBt(:,3).^2)];

Xd  =
cat(2,Xd0,Xd1,Xd2,Xd3,Xd4,Xd5,Xd6,Xd7,Xd8,Xd9,Xd10,Xd11,Xd12,Xd13,Xd14,Xd15,Xd16,Xd17,
Xd18,Xd19);

aR4 = Xd\RRGBt;
aG4 = Xd\GRGBt;
aB4 = Xd\BRGBt;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%now cat the coeffient of the i loop to coEfficient matrix
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

CoEff1(:,1,i)=aR1;
CoEff1(:,2,i)=aG1;
CoEff1(:,3,i)=aB1;

CoEff2(:,1,i)=aR2;
CoEff2(:,2,i)=aG2;
CoEff2(:,3,i)=aB2;

CoEff3(:,1,i)=aR3;
CoEff3(:,2,i)=aG3;
CoEff3(:,3,i)=aB3;
```

```
CoEff4(:,1,i)=aR4;
CoEff4(:,2,i)=aG4;
CoEff4(:,3,i)=aB4;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
    end
end

%  end  %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%                             %%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%  NEXT Calculate the input  %%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%                             %%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%File for Test image %

      INP  = wk1read(IN);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
for i=1:length(INP)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    INPt=INP(i,:);

    %%%%%%%%%%%%%%% part 01
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    if      (    (INP(i,1) > INP(i,2) & INP(i,2) > INP(i,3)) | (INP(i,1) == INP(i,2) &
INP(i,2) > INP(i,3))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,1);, aG1t=CoEff1(:,2,1);, aB1t=CoEff1(:,3,1);
            aR2t=CoEff2(:,1,1);, aG2t=CoEff2(:,2,1);, aB2t=CoEff2(:,3,1);
            aR3t=CoEff3(:,1,1);, aG3t=CoEff3(:,2,1);, aB3t=CoEff3(:,3,1);
            aR4t=CoEff4(:,1,1);, aG4t=CoEff4(:,2,1);, aB4t=CoEff4(:,3,1);

    elseif  (    (INP(i,1) > INP(i,2) & INP(i,2) > INP(i,3)) | (INP(i,1) == INP(i,2) &
INP(i,2) > INP(i,3))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,2);, aG1t=CoEff1(:,2,2);, aB1t=CoEff1(:,3,2);
            aR2t=CoEff2(:,1,2);, aG2t=CoEff2(:,2,2);, aB2t=CoEff2(:,3,2);
            aR3t=CoEff3(:,1,2);, aG3t=CoEff3(:,2,2);, aB3t=CoEff3(:,3,2);
            aR4t=CoEff4(:,1,2);, aG4t=CoEff4(:,2,2);, aB4t=CoEff4(:,3,2);

    %%%%%%%%%%%%%%% part 02
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif  (    (INP(i,1) > INP(i,3) & INP(i,3) > INP(i,2)) | (INP(i,2) == INP(i,3) &
INP(i,3) < INP(i,1))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,3);, aG1t=CoEff1(:,2,3);, aB1t=CoEff1(:,3,3);
            aR2t=CoEff2(:,1,3);, aG2t=CoEff2(:,2,3);, aB2t=CoEff2(:,3,3);
            aR3t=CoEff3(:,1,3);, aG3t=CoEff3(:,2,3);, aB3t=CoEff3(:,3,3);
            aR4t=CoEff4(:,1,3);, aG4t=CoEff4(:,2,3);, aB4t=CoEff4(:,3,3);

    elseif  (    (INP(i,1) > INP(i,3) & INP(i,3) > INP(i,2)) | (INP(i,2) == INP(i,3) &
INP(i,3) < INP(i,1))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,4);, aG1t=CoEff1(:,2,4);, aB1t=CoEff1(:,3,4);
            aR2t=CoEff2(:,1,4);, aG2t=CoEff2(:,2,4);, aB2t=CoEff2(:,3,4);
            aR3t=CoEff3(:,1,4);, aG3t=CoEff3(:,2,4);, aB3t=CoEff3(:,3,4);
            aR4t=CoEff4(:,1,4);, aG4t=CoEff4(:,2,4);, aB4t=CoEff4(:,3,4);

    %%%%%%%%%%%%%%% part 03
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif  (    (INP(i,3) > INP(i,1) & INP(i,1) > INP(i,2)) | (INP(i,1) == INP(i,3) &
INP(i,3) > INP(i,2))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,5);, aG1t=CoEff1(:,2,5);, aB1t=CoEff1(:,3,5);
            aR2t=CoEff2(:,1,5);, aG2t=CoEff2(:,2,5);, aB2t=CoEff2(:,3,5);
            aR3t=CoEff3(:,1,5);, aG3t=CoEff3(:,2,5);, aB3t=CoEff3(:,3,5);
```

```
            aR4t=CoEff4(:,1,5);, aG4t=CoEff4(:,2,5);, aB4t=CoEff4(:,3,5);

    elseif  (   (INP(i,3) > INP(i,1) & INP(i,1) > INP(i,2)) | (INP(i,1) == INP(i,3) &
INP(i,3) > INP(i,2))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,6);, aG1t=CoEff1(:,2,6);, aB1t=CoEff1(:,3,6);
            aR2t=CoEff2(:,1,6);, aG2t=CoEff2(:,2,6);, aB2t=CoEff2(:,3,6);
            aR3t=CoEff3(:,1,6);, aG3t=CoEff3(:,2,6);, aB3t=CoEff3(:,3,6);
            aR4t=CoEff4(:,1,6);, aG4t=CoEff4(:,2,6);, aB4t=CoEff4(:,3,6);

    %%%%%%%%%%%%%%% part 04
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif  (   (INP(i,2) > INP(i,1) & INP(i,1) > INP(i,3)) | (INP(i,1) == INP(i,3) &
INP(i,3) < INP(i,2))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,7);, aG1t=CoEff1(:,2,7);, aB1t=CoEff1(:,3,7);
            aR2t=CoEff2(:,1,7);, aG2t=CoEff2(:,2,7);, aB2t=CoEff2(:,3,7);
            aR3t=CoEff3(:,1,7);, aG3t=CoEff3(:,2,7);, aB3t=CoEff3(:,3,7);
            aR4t=CoEff4(:,1,7);, aG4t=CoEff4(:,2,7);, aB4t=CoEff4(:,3,7);

    elseif  (   (INP(i,2) > INP(i,1) & INP(i,1) > INP(i,3)) | (INP(i,1) == INP(i,3) &
INP(i,3) < INP(i,2))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,8);, aG1t=CoEff1(:,2,8);, aB1t=CoEff1(:,3,8);
            aR2t=CoEff2(:,1,8);, aG2t=CoEff2(:,2,8);, aB2t=CoEff2(:,3,8);
            aR3t=CoEff3(:,1,8);, aG3t=CoEff3(:,2,8);, aB3t=CoEff3(:,3,8);
            aR4t=CoEff4(:,1,8);, aG4t=CoEff4(:,2,8);, aB4t=CoEff4(:,3,8);

    %%%%%%%%%%%%%%% part 05
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif  (   (INP(i,2) > INP(i,3) & INP(i,3) > INP(i,1)) | (INP(i,2) == INP(i,3) &
INP(i,3) > INP(i,1))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,9);, aG1t=CoEff1(:,2,9);, aB1t=CoEff1(:,3,9);
            aR2t=CoEff2(:,1,9);, aG2t=CoEff2(:,2,9);, aB2t=CoEff2(:,3,9);
            aR3t=CoEff3(:,1,9);, aG3t=CoEff3(:,2,9);, aB3t=CoEff3(:,3,9);
            aR4t=CoEff4(:,1,9);, aG4t=CoEff4(:,2,9);, aB4t=CoEff4(:,3,9);

    elseif  (   (INP(i,2) > INP(i,3) & INP(i,3) > INP(i,1)) | (INP(i,2) == INP(i,3) &
INP(i,3) > INP(i,1))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,10);, aG1t=CoEff1(:,2,10);, aB1t=CoEff1(:,3,10);
            aR2t=CoEff2(:,1,10);, aG2t=CoEff2(:,2,10);, aB2t=CoEff2(:,3,10);
            aR3t=CoEff3(:,1,10);, aG3t=CoEff3(:,2,10);, aB3t=CoEff3(:,3,10);
            aR4t=CoEff4(:,1,10);, aG4t=CoEff4(:,2,10);, aB4t=CoEff4(:,3,10);

    %%%%%%%%%%%%%%% part 06
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif  (   (INP(i,3) > INP(i,2) & INP(i,2) > INP(i,1)) | (INP(i,1) == INP(i,2) &
INP(i,2) < INP(i,3))    ) & (INP(i,1)+INP(i,2)+INP(i,3) > 383)
            aR1t=CoEff1(:,1,11);, aG1t=CoEff1(:,2,11);, aB1t=CoEff1(:,3,11);
            aR2t=CoEff2(:,1,11);, aG2t=CoEff2(:,2,11);, aB2t=CoEff2(:,3,11);
            aR3t=CoEff3(:,1,11);, aG3t=CoEff3(:,2,11);, aB3t=CoEff3(:,3,11);
            aR4t=CoEff4(:,1,11);, aG4t=CoEff4(:,2,11);, aB4t=CoEff4(:,3,11);

    elseif  (   (INP(i,3) > INP(i,2) & INP(i,2) > INP(i,1)) | (INP(i,1) == INP(i,2) &
INP(i,2) < INP(i,3))    ) & (INP(i,1)+INP(i,2)+INP(i,3) < 384)
            aR1t=CoEff1(:,1,12);, aG1t=CoEff1(:,2,12);, aB1t=CoEff1(:,3,12);
            aR2t=CoEff2(:,1,12);, aG2t=CoEff2(:,2,12);, aB2t=CoEff2(:,3,12);
            aR3t=CoEff3(:,1,12);, aG3t=CoEff3(:,2,12);, aB3t=CoEff3(:,3,12);
            aR4t=CoEff4(:,1,12);, aG4t=CoEff4(:,2,12);, aB4t=CoEff4(:,3,12);


    %%%%%%%%%%%%%%% part 07
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
    %%%%%%%%%%%%%%% part 07
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    elseif      INP(i,1)==INP(i,2) & INP(i,2)==INP(i,3)
            aR1t=CoEff1(:,1,13);, aG1t=CoEff1(:,2,13);, aB1t=CoEff1(:,3,13);
            aR2t=CoEff2(:,1,13);, aG2t=CoEff2(:,2,13);, aB2t=CoEff2(:,3,13);
            aR3t=CoEff3(:,1,13);, aG3t=CoEff3(:,2,13);, aB3t=CoEff3(:,3,13);
            aR4t=CoEff4(:,1,13);, aG4t=CoEff4(:,2,13);, aB4t=CoEff4(:,3,13);
```

```
    %%%%%%%%%%%%%%%% part 07
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
    %%%%%%%%%%%%%%%% part 07
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    end


        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        % first order 04 calculate  %
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%

            INPa = cat(2,ones(1,1),INPt);
            %%%%%%%%%%%%%%%%%%%
            Rout1 = INPa*aR1t;
            Gout1 = INPa*aG1t;
            Bout1 = INPa*aB1t;

        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        % second order calculate    %
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
            INPb0 = ones(1,1);
            INPb1 = INPt(:,1);
            INPb2 = INPt(:,2);
            INPb3 = INPt(:,3);
            INPb4 = [INPt(:,1).*INPt(:,2)];
            INPb5 = [INPt(:,2).*INPt(:,3)];
            INPb6 = [INPt(:,1).*INPt(:,3)];
            INPb7 = INPt(:,1).^2;
            INPb8 = INPt(:,2).^2;
            INPb9 = INPt(:,3).^2;
            INPb10= [INPt(:,1).*INPt(:,2).*INPt(:,3)];

            INPb =
cat(2,INPb0,INPb1,INPb2,INPb3,INPb4,INPb5,INPb6,INPb7,INPb8,INPb9,INPb10);
            %%%%%%%%%%%%%%%%%%
            Rout2 = INPb*aR2t;
            Gout2 = INPb*aG2t;
            Bout2 = INPb*aB2t;

        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        % Third order14 calculate   %
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
             INPc0 = ones(1,1);
             INPc1 = INPt(:,1);
             INPc2 = INPt(:,2);
             INPc3 = INPt(:,3);
             INPc4 = [INPt(:,1).*INPt(:,2)];
             INPc5 = [INPt(:,2).*INPt(:,3)];
             INPc6 = [INPt(:,1).*INPt(:,3)];
             INPc7 = INPt(:,1).^2;
             INPc8 = INPt(:,2).^2;
             INPc9 = INPt(:,3).^2;
             INPc10= [INPt(:,1).*INPt(:,2).*INPt(:,3)];
             INPc11= INPt(:,1).^3;
             INPc12= INPt(:,2).^3;
             INPc13= INPt(:,3).^3;

             INPc =
cat(2,INPc0,INPc1,INPc2,INPc3,INPc4,INPc5,INPc6,INPc7,INPc8,INPc9,INPc10,INPc11,INPc12
,INPc13);
            %%%%%%%%%%%%%%%%%%
             Rout3 = INPc*aR3t;
             Gout3 = INPc*aG3t;
             Bout3 = INPc*aB3t;

        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        % Third order20 calculate   %
        %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
            INPd0  = ones(1,1);
            INPd1  = INPt(:,1);
            INPd2  = INPt(:,2);
            INPd3  = INPt(:,3);
            INPd4  = [INPt(:,1).*INPt(:,2)];
            INPd5  = [INPt(:,2).*INPt(:,3)];
            INPd6  = [INPt(:,1).*INPt(:,3)];
            INPd7  = INPt(:,1).^2;
            INPd8  = INPt(:,2).^2;
            INPd9  = INPt(:,3).^2;
            INPd10= [INPt(:,1).*INPt(:,2).*INPt(:,3)];
            INPd11= INPt(:,1).^3;
            INPd12= INPt(:,2).^3;
            INPd13= INPt(:,3).^3;
            INPd14= [INPt(:,1).*(INPt(:,2).^2);];
            INPd15= [INPt(:,2).*(INPt(:,1).^2);];
            INPd16= [INPt(:,2).*(INPt(:,3).^2);];
            INPd17= [INPt(:,3).*(INPt(:,2).^2);];
            INPd18= [INPt(:,3).*(INPt(:,1).^2);];
            INPd19= [INPt(:,1).*(INPt(:,3).^2);];

            INPd =
cat(2,INPd0,INPd1,INPd2,INPd3,INPd4,INPd5,INPd6,INPd7,INPd8,INPd9,INPd10,INPd11,INPd12
,INPd13,INPd14,INPd15,INPd16,INPd17,INPd18,INPd19);
            %%%%%%%%%%%%%%%%%%
            Rout4 = INPd*aR4t;
            Gout4 = INPd*aG4t;
            Bout4 = INPd*aB4t;

                %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
                % Get result in to matrices Output are P1 P2 P3 P4        %
                %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
                    P1(i,:)= cat(2,Rout1,Gout1,Bout1);
                    P2(i,:)= cat(2,Rout2,Gout2,Bout2);
                    P3(i,:)= cat(2,Rout3,Gout3,Bout3);
                    P4(i,:)= cat(2,Rout4,Gout4,Bout4);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
end%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
%This is for Whole space

S = input('give me LUT of SGB(scale255) to RGB(scale255) file wk1:\\','s')

IN= input('give me your Input file SGB(scale255) file wk1:\\','s')

% File for LUT %
         LoUp  = wk1read(S);
         Row1 = length(LoUp);

      SGB  = LoUp(:,1:3);

      RRGB = LoUp(:,4);             %RRGB
         GRGB = LoUp(:,5);          %GRGB
      BRGB = LoUp(:,6);             %BRGB

% File for Test image %

         INP  = wk1read(IN);
         Row2 = length(INP);

%%%%%%%%% retrive file name to write TIFF later %%%%%%%%%%
IN(:,end-3:end)=[]                                       %
 S(:,end-3:end)=[]                                       %
%%%%%%%%% retrive file name to write TIFF later %%%%%%%%%% .

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Here, Coefficient matrix                               %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
aR1 = zeros(4,1);
aG1 = zeros(4,1);
aB1 = zeros(4,1);

aR2 = zeros(11,1);
aG2 = zeros(11,1);
aB2 = zeros(11,1);

aR3 = zeros(14,1);
aG3 = zeros(14,1);
aB3 = zeros(14,1);

aR4 = zeros(20,1);
aG4 = zeros(20,1);
aB4 = zeros(20,1);


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% first order 04 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xa = cat(2,ones(Row1,1),SGB);

aR1 = Xa\RRGB
aG1 = Xa\GRGB
aB1 = Xa\BRGB                                             .


% first order 04 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
INPa = cat(2,ones(Row2,1),INP);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        Rout1 = INPa*aR1;
        Gout1 = INPa*aG1;
        Bout1 = INPa*aB1;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Make result matrix to Image%
% first order 04 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
            P = cat(2,Rout1,Gout1,Bout1);
           Pz1= length(P);
            q = Pz1+1;

for i=q:750
        P(i,:)= [255 255 255];
end

            s = 2*ceil((25-(Pz1-(25*(fix(Pz1/25)))))/2)

for i=q:2:(q+s-1)
       P(i,:) = [0 0 0];
end

x=P(:,1,1);
y=P(:,2,1);
z=P(:,3,1);

% make each RGB column to each matrix x,y,z

x = (reshape(x,25,30))/255;
y = (reshape(y,25,30))/255;
z = (reshape(z,25,30))/255;

W = zeros(25,30,3);

% Reshape each matrix to 25 by 30
% divide to be 0-1 value
% (because of matlab needed)
% now set W matrix that 25 by 30 by 3
% to fill with R,G,B value

for i=1:25
        for j=1:30
        W(i,j,1)=x(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,2)=y(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,3)=z(i,j,1);
   end
end

%Here you get each pixel per patch

U=zeros(625,750,3);

% Let interpolate T to be N
% Output is 625x750 pixel,
% RGB image, each patch is 25x25 pixel

for i=1:25
   for j=1:30
    U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),1) = W(i,j,1);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),2) = W(i,j,2);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),3) = W(i,j,3);
        end
end

% put time stamp file name %

O = datestr(now,0);
O(1,15) = 'h'
O(1,18) = 'm'

H = ['w_cal3x04_',IN,' by ',S,' at ',O,'.tif'];
```

```
imwrite (U,H,'tif','resolution',100)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% second order 11 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xb0 = ones(Row1,1);
Xb1 = SGB(:,1);
Xb2 = SGB(:,2);
Xb3 = SGB(:,3);
Xb4 = [SGB(:,1).*SGB(:,2)];
Xb5 = [SGB(:,2).*SGB(:,3)];
Xb6 = [SGB(:,1).*SGB(:,3)];
Xb7 = SGB(:,1).^2;
Xb8 = SGB(:,2).^2;
Xb9 = SGB(:,3).^2;
Xb10= [SGB(:,1).*SGB(:,2).*SGB(:,3)];

Xb  = cat(2,Xb0,Xb1,Xb2,Xb3,Xb4,Xb5,Xb6,Xb7,Xb8,Xb9,Xb10);

aR2 = Xb\RRGB;
aG2 = Xb\GRGB;
aB2 = Xb\BRGB;

% second order 11 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
INPb0 = ones(Row2,1);
INPb1 = INP(:,1);
INPb2 = INP(:,2);
INPb3 = INP(:,3);
INPb4 = [INP(:,1).*INP(:,2)];
INPb5 = [INP(:,2).*INP(:,3)];
INPb6 = [INP(:,1).*INP(:,3)];
INPb7 = INP(:,1).^2;
INPb8 = INP(:,2).^2;
INPb9 = INP(:,3).^2;
INPb10= [INP(:,1).*INP(:,2).*INP(:,3)];

INPb = cat(2,INPb0,INPb1,INPb2,INPb3,INPb4,INPb5,INPb6,INPb7,INPb8,INPb9,INPb10);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Rout2 = INPb*aR2;
Gout2 = INPb*aG2;
Bout2 = INPb*aB2;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Make result matrix to Image%
% first order 04 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
             P = cat(2,Rout2,Gout2,Bout2);
            Pz1= length(P);
             q = Pz1+1;

for i=q:750
        P(i,:)= [255 255 255];
end

            s = 2*ceil((25-(Pz1-(25*(fix(Pz1/25)))))/2)

for i=q:2:(q+s-1)
       P(i,:) = [0 0 0];
end

x=P(:,1,1);
y=P(:,2,1);
z=P(:,3,1);

% make each RGB column to each matrix x,y,z

x = (reshape(x,25,30))/255;
y = (reshape(y,25,30))/255;
```

```
z = (reshape(z,25,30))/255;

W = zeros(25,30,3);

% Reshape each matrix to 25 by 30
% divide to be 0-1 value
% (because of matlab needed)
% now set W matrix that 25 by 30 by 3
% to fill with R,G,B value

for i=1:25
        for j=1:30
        W(i,j,1)=x(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,2)=y(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,3)=z(i,j,1);
   end
end

%Here you get each pixel per patch

U=zeros(625,750,3);

% Let interpolate T to be N
% Output is 625x750 pixel,
% RGB image, each patch is 25x25 pixel

for i=1:25
   for j=1:30
    U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),1) = W(i,j,1);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),2) = W(i,j,2);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),3) = W(i,j,3);
        end
end

% put time stamp file name %

O = datestr(now,0);
O(1,15) = 'h'
O(1,18) = 'm'

H = ['w_cal3x11_',IN,' by ',S,' at ',O,'.tif'];

imwrite (U,H,'tif','resolution',100)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Third order 14 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xc0 = ones(Row1,1);
Xc1 = SGB(:,1);
Xc2 = SGB(:,2);
Xc3 = SGB(:,3);
Xc4 = [SGB(:,1).*SGB(:,2)];
Xc5 = [SGB(:,2).*SGB(:,3)];
Xc6 = [SGB(:,1).*SGB(:,3)];
Xc7 = SGB(:,1).^2;
Xc8 = SGB(:,2).^2;
Xc9 = SGB(:,3).^2;
Xc10= [SGB(:,1).*SGB(:,2).*SGB(:,3)];
Xc11= SGB(:,1).^3;
Xc12= SGB(:,2).^3;
Xc13= SGB(:,3).^3;
```

```
Xc  = cat(2,Xc0,Xc1,Xc2,Xc3,Xc4,Xc5,Xc6,Xc7,Xc8,Xc9,Xc10,Xc11,Xc12,Xc13);

aR3 = Xc\RRGB;
aG3 = Xc\GRGB;
aB3 = Xc\BRGB;

% Third order 14 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
INPc0 = ones(Row2,1);
INPc1 = INP(:,1);
INPc2 = INP(:,2);
INPc3 = INP(:,3);
INPc4 = [INP(:,1).*INP(:,2)];
INPc5 = [INP(:,2).*INP(:,3)];
INPc6 = [INP(:,1).*INP(:,3)];
INPc7 = INP(:,1).^2;
INPc8 = INP(:,2).^2;
INPc9 = INP(:,3).^2;
INPc10= [INP(:,1).*INP(:,2).*INP(:,3)];
INPc11= INP(:,1).^3;
INPc12= INP(:,2).^3;
INPc13= INP(:,3).^3;

INPc =
cat(2,INPc0,INPc1,INPc2,INPc3,INPc4,INPc5,INPc6,INPc7,INPc8,INPc9,INPc10,INPc11,INPc12
,INPc13);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Rout3 = INPc*aR3;
Gout3 = INPc*aG3;
Bout3 = INPc*aB3;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Make result matrix to Image%
% first order 04 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
             P = cat(2,Rout3,Gout3,Bout3);
            Pz1= length(P);
             q = Pz1+1;

for i=q:750
        P(i,:)= [255 255 255];
end

            s = 2*ceil((25-(Pz1-(25*(fix(Pz1/25)))))/2)

for i=q:2:(q+s-1)
       P(i,:) = [0 0 0];
end

x=P(:,1,1);
y=P(:,2,1);
z=P(:,3,1);

% make each RGB column to each matrix x,y,z

x = (reshape(x,25,30))/255;
y = (reshape(y,25,30))/255;
z = (reshape(z,25,30))/255;

W = zeros(25,30,3);

% Reshape each matrix to 25 by 30
% divide to be 0-1 value
% (because of matlab needed)
% now set W matrix that 25 by 30 by 3
% to fill with R,G,B value

for i=1:25
        for j=1:30
        W(i,j,1)=x(i,j,1);
   end
```

```
end

for i=1:25
        for j=1:30
        W(i,j,2)=y(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,3)=z(i,j,1);
   end
end

%Here you get each pixel per patch

U=zeros(625,750,3);

% Let interpolate T to be N
% Output is 625x750 pixel,
% RGB image, each patch is 25x25 pixel

for i=1:25
   for j=1:30
    U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),1) = W(i,j,1);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),2) = W(i,j,2);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),3) = W(i,j,3);
        end
end

% put time stamp file name %

O = datestr(now,0);
O(1,15) = 'h'
O(1,18) = 'm'

H = ['w_cal3x14_',IN,' by ',S,' at ',O,'.tif'];

imwrite (U,H,'tif','resolution',100)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Third order 20 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Xd0 = ones(Row1,1);
Xd1 = SGB(:,1);
Xd2 = SGB(:,2);
Xd3 = SGB(:,3);
Xd4 = [SGB(:,1).*SGB(:,2)];
Xd5 = [SGB(:,2).*SGB(:,3)];
Xd6 = [SGB(:,1).*SGB(:,3)];
Xd7 = SGB(:,1).^2;
Xd8 = SGB(:,2).^2;
Xd9 = SGB(:,3).^2;
Xd10= [SGB(:,1).*SGB(:,2).*SGB(:,3)];
Xd11= SGB(:,1).^3;
Xd12= SGB(:,2).^3;
Xd13= SGB(:,3).^3;
Xd14= [SGB(:,1).*(SGB(:,2).^2)];
Xd15= [SGB(:,2).*(SGB(:,1).^2)];
Xd16= [SGB(:,2).*(SGB(:,3).^2)];
Xd17= [SGB(:,3).*(SGB(:,2).^2)];
Xd18= [SGB(:,3).*(SGB(:,1).^2)];
Xd19= [SGB(:,1).*(SGB(:,3).^2)];

Xd =
cat(2,Xd0,Xd1,Xd2,Xd3,Xd4,Xd5,Xd6,Xd7,Xd8,Xd9,Xd10,Xd11,Xd12,Xd13,Xd14,Xd15,Xd16,Xd17,
Xd18,Xd19);

aR4 = Xd\RRGB;
aG4 = Xd\GRGB;
aB4 = Xd\BRGB;
```

```
% Third order 14 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
INPd0 = ones(Row2,1);
INPd1 = INP(:,1);
INPd2 = INP(:,2);
INPd3 = INP(:,3);
INPd4 = [INP(:,1).*INP(:,2)];
INPd5 = [INP(:,2).*INP(:,3)];
INPd6 = [INP(:,1).*INP(:,3)];
INPd7 = INP(:,1).^2;
INPd8 = INP(:,2).^2;
INPd9 = INP(:,3).^2;
INPd10= [INP(:,1).*INP(:,2).*INP(:,3)];
INPd11= INP(:,1).^3;
INPd12= INP(:,2).^3;
INPd13= INP(:,3).^3;
INPd14= [INP(:,1).*(INP(:,2).^2);];
INPd15= [INP(:,2).*(INP(:,1).^2);];
INPd16= [INP(:,2).*(INP(:,3).^2);];
INPd17= [INP(:,3).*(INP(:,2).^2);];
INPd18= [INP(:,3).*(INP(:,1).^2);];
INPd19= [INP(:,1).*(INP(:,3).^2);];

INPd =
cat(2,INPd0,INPd1,INPd2,INPd3,INPd4,INPd5,INPd6,INPd7,INPd8,INPd9,INPd10,INPd11,INPd12
,INPd13,INPd14,INPd15,INPd16,INPd17,INPd18,INPd19);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Rout4 = INPd*aR4;
Gout4 = INPd*aG4;
Bout4 = INPd*aB4;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Make result matrix to Image%
% first order 04 calculate  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
             P = cat(2,Rout4,Gout4,Bout4);
            Pz1= length(P);
             q = Pz1+1;

for i=q:750
        P(i,:)= [255 255 255];
end

            s = 2*ceil((25-(Pz1-(25*(fix(Pz1/25)))))/2)

for i=q:2:(q+s-1)
       P(i,:) = [0 0 0];
end

x=P(:,1,1);
y=P(:,2,1);
z=P(:,3,1);

% make each RGB column to each matrix x,y,z

x = (reshape(x,25,30))/255;
y = (reshape(y,25,30))/255;
z = (reshape(z,25,30))/255;

W = zeros(25,30,3);

% Reshape each matrix to 25 by 30
% divide to be 0-1 value
% (because of matlab needed)
% now set W matrix that 25 by 30 by 3
% to fill with R,G,B value

for i=1:25
        for j=1:30
        W(i,j,1)=x(i,j,1);
```

```
   end
end

for i=1:25
        for j=1:30
        W(i,j,2)=y(i,j,1);
   end
end

for i=1:25
        for j=1:30
        W(i,j,3)=z(i,j,1);
   end
end

%Here you get each pixel per patch

U=zeros(625,750,3);

% Let interpolate T to be N
% Output is 625x750 pixel,
% RGB image, each patch is 25x25 pixel

for i=1:25
   for j=1:30
    U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),1) = W(i,j,1);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),2) = W(i,j,2);
        U((((25*i)-24):1:(25*i)),(((25*j)-24):1:(25*j)),3) = W(i,j,3);
        end
end

% put time stamp file name %

O = datestr(now,0);
O(1,15) = 'h'
O(1,18) = 'm'

H = ['w_cal3x20_',IN,' by ',S,' at ',O,'.tif'];

imwrite (U,H,'tif','resolution',100)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

VITA

Mr. Prasir Cunthasaksiri was born on January 3, 1972 in Bangkok, Thailand. He received his B.Eng. degree in Mechanical Engineer from the Faculty of Engineer, Kasetsart University in 1996, and he has been a graduate student in the Imaging Technology Program, Graduate school, Chulalongkorn University since 1998.