Project Progress X

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This piece of work is intended not only to present the results of the proposed search algorithm but also to give proper comparisons between the other algorithms which were implemented earlier. The results obtained in this comparison clearly express that the proposed one has served the purpose of the project if we leave away the hardware implementation of it. The comparison of this method with FS and LS shows that how efficiently it is able to exploit the advantages of both the search algorithms, that is, it is better in prediction than LS and less computational than FS.
The following MATLAB code was implemented to compare between Full search (FS), Logarithmic search(LS) and the Proposed method:

Contents

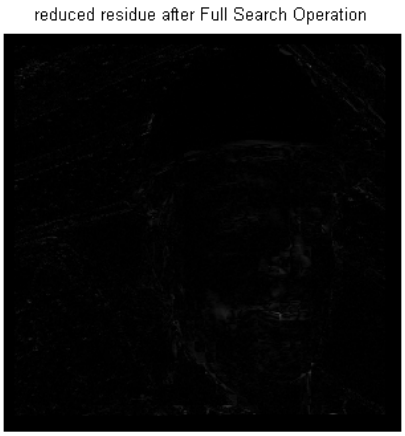
Full Search

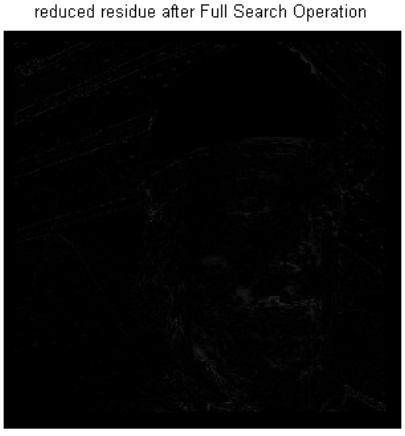
```
clc
clear all
close all
Frame=[1 2 3 4 5 6 7 8 9];
f_ref(1:300,1:300)=0;
Im=imread('E:\foreman_10frames\f001.pgm');
f_ref(9:288,9:288)= Im(9:288,9:288);
srcFiles = dir('E:\foreman_10frames\*.pgm');

f_p=zeros(300,3000);
X=zeros(35,350);
Y=zeros(35,350);
MSE_Full=zeros(1,9);
tstart_full=cputime;
for frameNo=1:9
    filename = strcat('E:\foreman_10frames\',srcFiles(frameNo+1).name);
    f_2(1:300,1:300)=0;
    Im2= imread(filename);
    f_2(9:288,9:288)= Im2(9:288,9:288);

    s=1;
```

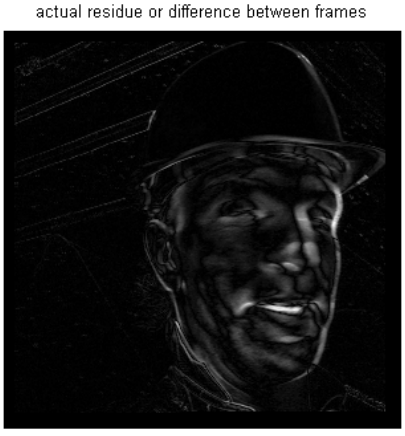
```
    X_motion=zeros(35);
    Y_motion=zeros(35);
    f_pre(1:300,1:300)=0;
    for i=9:8:288
        t=1;
        for j=9:8:288

            img_abs=zeros(8,8);
            img_24=f_ref(i-8:i+7+8,j-8:j+7+8);
            img_8=f_2(i:i+7,j:j+7);

            for p=1:17
                for q=1:17

                    img_abs(p,q)=sum(sum((img_24(p:p+7,q:q+7)- img_8).^2));
                end
            end

            [M,I] = min(img_abs(:));
            [row_cor, col_cor] = ind2sub(size(img_abs),I);


            f_pre(i:i+7,j:j+7)=img_24(row_cor:row_cor+7,col_cor:col_cor+7);

            X_motion(s,t)= row_cor -9;
            Y_motion(s,t)= col_cor -9;
            t=t+1;
        end

        s=s+1;
    end
    f_p(1:300, 1+(300*frameNo):300*(frameNo+1))=f_pre;
    X(1:35, 1+(35*(frameNo-1)):35*frameNo)=X_motion;
    Y(1:35, 1+(35*(frameNo-1)):35*frameNo)=Y_motion;

    residu1=abs(f_2-f_pre);
    MSE_Full(frameNo)=(sum(sum((residu1).^2)))/90000;
    figure,imshow(uint8(residu1));
    title('reduced residue after Full Search Operation');
    figure,imshowpair(f_2,f_ref,'diff');
    title('actual residue or difference between frames');
    f_ref=f_2;
end
telapsed_full=cputime-tstart_full;
figure,fullSearch=plot(Frame,MSE_Full);
title('Mean Square Error [MSE] Vs Frames Plot');
ylabel('MSE found in Full Search');
xlabel('Frame number');
display(telapsed_full);
display(MSE_Full);
```

```
telapsed_full =

   67.9688
```

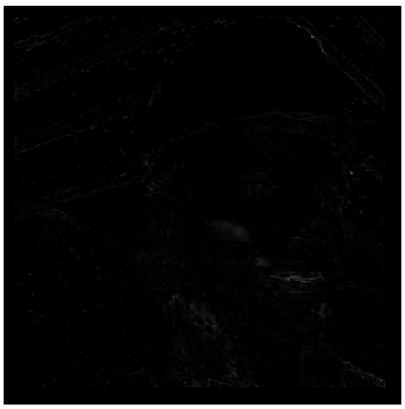
```
MSE_Full =

  Columns 1 through 7

   16.1771   13.6825   17.0184   14.1686   10.9892   16.2380   13.9718

  Columns 8 through 9

   16.2779   17.8741
```





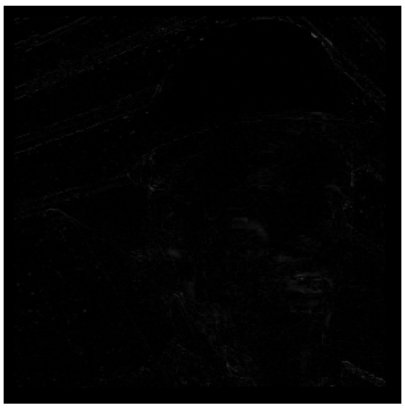


reduced residue after Full Search Operation



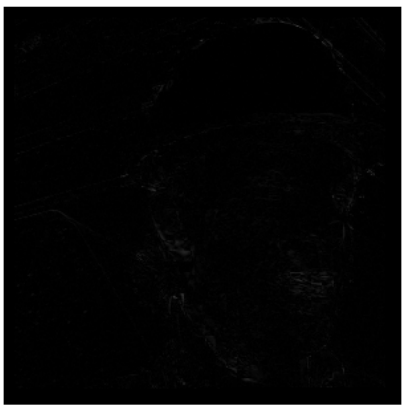
actual residue or difference between frames

reduced residue after Full Search Operation



actual residue or difference between frames

reduced residue after Full Search Operation



actual residue or difference between frames

reduced residue after Full Search Operation

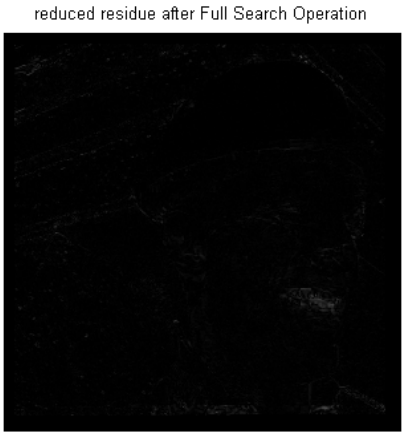
actual residue or difference between frames

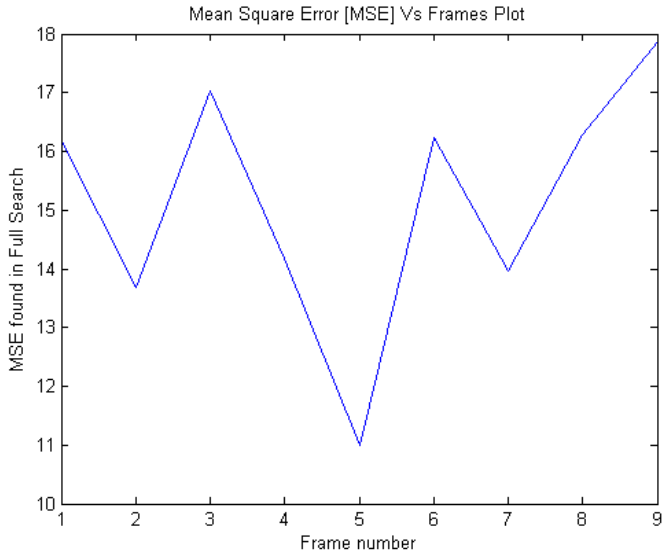
reduced residue after Full Search Operation

actual residue or difference between frames

reduced residue after Full Search Operation

actual residue or difference between frames





Logarithmic Search

```
f_ref(1:300,1:300)=0;
Im=imread('E:\foreman_10frames\f001.pgm');
 f_ref(9:288,9:288)= Im(9:288,9:288);
f_p=zeros(300,3000);
X=zeros(35,350);
Y=zeros(35,350);
MSE_Log=zeros(1,9);
tstart_log=cputime;
for frameNo=1:9
    filename = strcat('E:\foreman_10frames\',srcFiles(frameNo+1).name);
     f_2(1:300,1:300)=0;
    Im2= imread(filename);
    f_2(9:288,9:288)= Im2(9:288,9:288);
    f_pre(1:300,1:300)=0;

s=1;
X_motion= zeros(22,22);
```

```
Y_motion=zeros(22,22);
for i=9:8:288
    t=1;
    for j=9:8:288
 img_abs=[0 0 0 0 0];
img_24=f_ref(i-8:i+7+8,j-8:j+7+8);
img_8=f_2(i:i+7,j:j+7);
flag = 1;
I=1;
Rc=9;
Cc=9;
step_size=4;

while flag
    r=[Rc,Rc-step_size,Rc,Rc,Rc+step_size];
    c=[Cc,Cc,Cc-step_size,Cc+step_size,Cc];

    for g=1:5
    if r(g)<=0 || r(g)>=17
        img_abs(g)=255*64*255;
    elseif c(g)<=0 || c(g)>=17
        img_abs(g)=255*64*255;
    elseif g==I && g-1>0
        img_abs(g)=255*64*255;
    else
        img_abs(g)=sum(sum((img_24(r(g):r(g)+7,c(g):c(g)+7)- img_8).^2));
    end
    end


[M,I] = min(img_abs);
switch (I)
    case 1
        step_size=step_size/2;
    case 2
        Rc=Rc-step_size;
    case 3
        Cc=Cc-step_size;
    case 4
        Cc=Cc+step_size;
    case 5
        Rc=Rc+step_size;
end
if step_size<1
    flag=0;
    break;
else
    continue;
end
end
    f_pre(i:i+7,j:j+7)=img_24(Rc:Rc+7,Cc:Cc+7);
    X_motion(s,t)= Rc-9;
    Y_motion(s,t)= Cc-9;
```

```
t=t+1;
    end
    s=s+1;

end
f_p(1:300, 1+(300*frameNo):300*(frameNo+1))=f_pre;
X(1:35, 1+(35*(frameNo-1)):35*frameNo)=X_motion;
Y(1:35, 1+(35*(frameNo-1)):35*frameNo)=Y_motion;


residu=abs(f_2-f_pre);
MSE_Log(frameNo)=(sum(sum((residu).^2)))/90000;
figure,imshow(uint8(residu));
title('reduced residue after Logarithmic Search Operation');
figure,imshowpair(f_2,f_ref,'diff');
title('actual residue or difference between frames');

f_ref=f_2;
end
telapsed_log=cputime-tstart_log;
figure,LogSearch=plot(Frame,MSE_Log);
title('Mean Square Error [MSE] Vs Frames Plot');
ylabel('MSE found in Logarithmic Search');
xlabel('Frame number');
display(telapsed_log);
display(MSE_Log);


telapsed_log =

   12.4375


MSE_Log =

  Columns 1 through 7

   23.2319   18.5147   21.4357   18.4010   15.1979   20.9555   22.0864

  Columns 8 through 9

   24.6960   25.6278
```

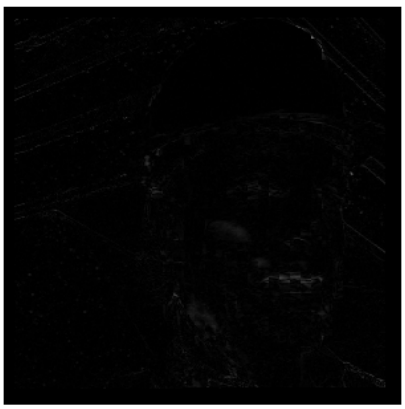
reduced residue after Logarithmic Search Operation

actual residue or difference between frames

reduced residue after Logarithmic Search Operation

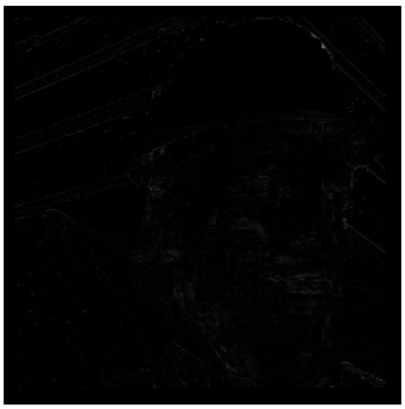
actual residue or difference between frames

reduced residue after Logarithmic Search Operation



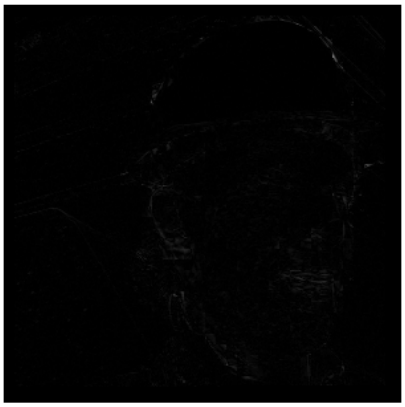
actual residue or difference between frames

reduced residue after Logarithmic Search Operation



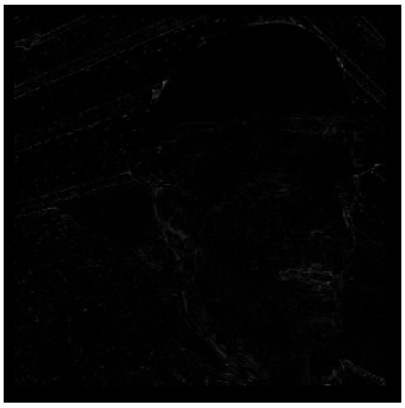
actual residue or difference between frames

reduced residue after Logarithmic Search Operation



actual residue or difference between frames

reduced residue after Logarithmic Search Operation

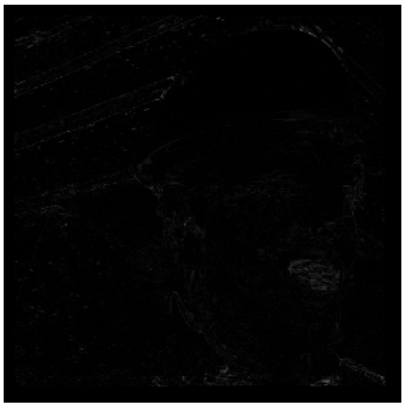


actual residue or difference between frames

reduced residue after Logarithmic Search Operation

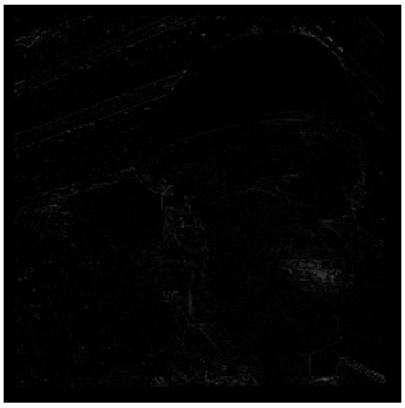
actual residue or difference between frames

reduced residue after Logarithmic Search Operation

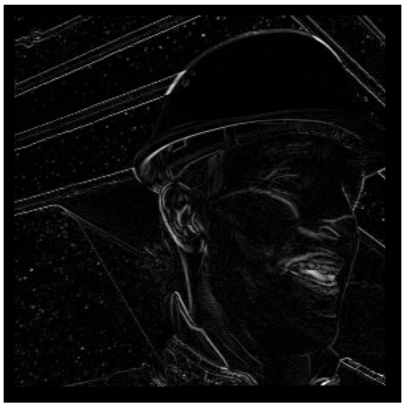


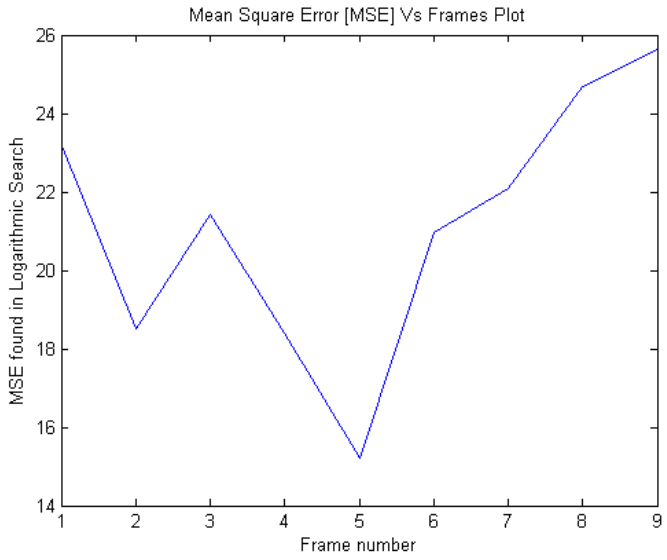
actual residue or difference between frames

reduced residue after Logarithmic Search Operation



actual residue or difference between frames





Full and Logarithmic Search

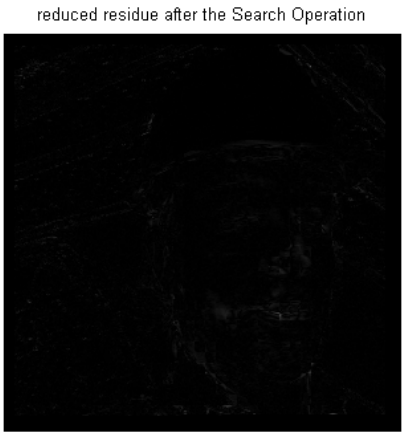
```
f_ref(1:300,1:300)=0;
Im=imread('E:\foreman_10frames\f001.pgm');
f_ref(9:288,9:288)= Im(9:288,9:288);

f_p=zeros(300,3000);
X=zeros(35,350);
Y=zeros(35,350);
fg=1;
change=0;
MSE_Proposed=zeros(1,9);
tstart_fullLog=cputime;
for frameNo=1:9
    filename = strcat('E:\foreman_10frames\',srcFiles(frameNo+1).name);
    f_2(1:300,1:300)=0;
    Im2= imread(filename);
    f_2(9:288,9:288)= Im2(9:288,9:288);

    X_motion=zeros(35);
    Y_motion=zeros(35);

    f_pre(1:300,1:300)=0;

    if fg==1

        s=1;
        for i=9:8:288
            t=1;
            for j=9:8:288

                img_abs=zeros(8,8);
                img_24=f_ref(i-8:i+7+8,j-8:j+7+8);
                img_8=f_2(i:i+7,j:j+7);
```

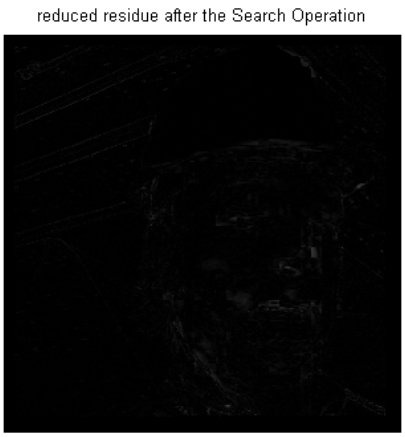
```
            for p=1:17
                for q=1:17

                    img_abs(p,q)=sum(sum((img_24(p:p+7,q:q+7)- img_8).^2));
                end
            end

            [M,I] = min(img_abs(:));
            [row_cor, col_cor] = ind2sub(size(img_abs),I);


            f_pre(i:i+7,j:j+7)=img_24(row_cor:row_cor+7,col_cor:col_cor+7);

            X_motion(s,t)= row_cor -9;
            Y_motion(s,t)= col_cor -9;
            t=t+1;
        end
        s=s+1;
    end

elseif fg==0
    s=1;
    X_motion= zeros(22,22);
    Y_motion=zeros(22,22);
    for i=9:8:288
        t=1;
        for j=9:8:288
            img_abs=[0 0 0 0 0];
            img_24=f_ref(i-8:i+7+8,j-8:j+7+8);
            img_8=f_2(i:i+7,j:j+7);
            flag = 1;
            I=1;
            Rc=9;
            Cc=9;
            step_size=4;

            while flag
                r=[Rc,Rc-step_size,Rc,Rc,Rc+step_size];
                c=[Cc,Cc,Cc-step_size,Cc+step_size,Cc];

                for g=1:5
                    if r(g)<=0 || r(g)>=17
                        img_abs(g)=255*64*255;
                    elseif c(g)<=0 || c(g)>=17
                        img_abs(g)=255*64*255;
                    elseif g==I && g-1>0
                        img_abs(g)=255*64*255;
                    else
                        img_abs(g)=sum(sum((img_24(r(g):r(g)+7,c(g):c(g)+7)- img_8).^2));
                    end
                end


                [M,I] = min(img_abs);
```

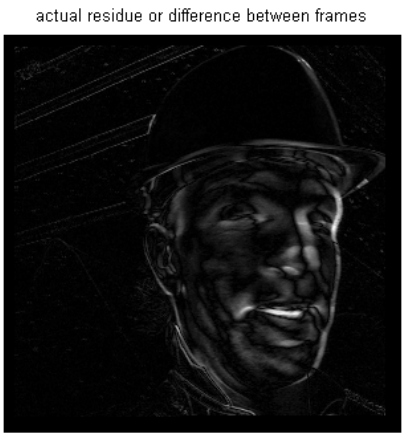
```
                    switch (I)
                        case 1
                            step_size=step_size/2;
                        case 2
                            Rc=Rc-step_size;
                        case 3
                            Cc=Cc-step_size;
                        case 4
                            Cc=Cc+step_size;
                        case 5
                            Rc=Rc+step_size;
                    end
                    if step_size<1
                        flag=0;
                        break;
                    else
                        continue;
                    end
                end
                f_pre(i:i+7,j:j+7)=img_24(Rc:Rc+7,Cc:Cc+7);
                X_motion(s,t)= Rc-9;
                Y_motion(s,t)= Cc-9;

                t=t+1;
            end
            s=s+1;
        end

    end


    change=change+1;
    if change<4
        fg=0;
    elseif change==4
        change=0;
        fg=1;
    end

    f_p(1:300, 1+(300*frameNo):300*(frameNo+1))=f_pre;
    X(1:35, 1+(35*(frameNo-1)):35*frameNo)=X_motion;
    Y(1:35, 1+(35*(frameNo-1)):35*frameNo)=Y_motion;

    residu1=abs(f_2-f_pre);
    MSE_Proposed(frameNo)=(sum(sum((residu1).^2)))/90000;
    figure,imshow(uint8(residu1));
    title('reduced residue after the Search Operation');
    figure,imshowpair(f_2,f_ref,'diff');
    title('actual residue or difference between frames');
    f_ref=f_2;
end
telapsed_Proposed=cputime-tstart_fullLog;
figure,FullLogSearch=plot(Frame,MSE_Proposed);
title('Mean Square Error [MSE] Vs Frames Plot');
```

```
ylabel('MSE found in Proposed Search');
xlabel('Frame number');
display(telapsed_Proposed);
display(MSE_Proposed);
```

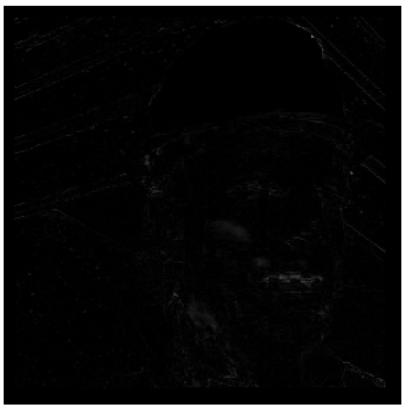
```
telapsed_Proposed =

   32.7969


MSE_Proposed =

  Columns 1 through 7

   16.1771   18.5147   21.4357   18.4010   10.9892   20.9555   22.0864

  Columns 8 through 9

   24.6960   17.8741
```





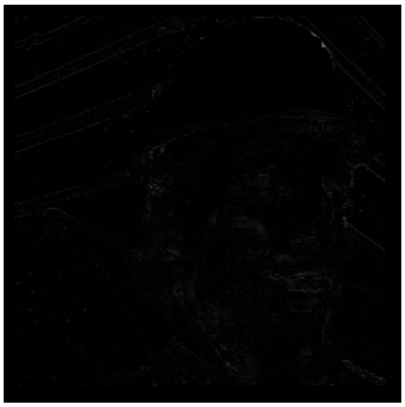


reduced residue after the Search Operation



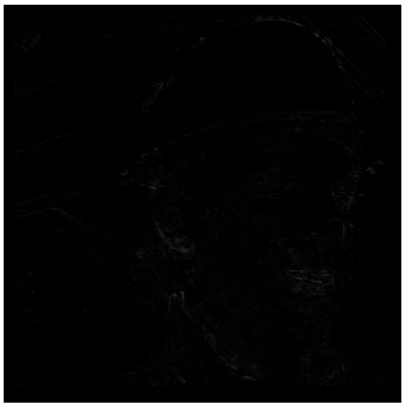
actual residue or difference between frames

reduced residue after the Search Operation



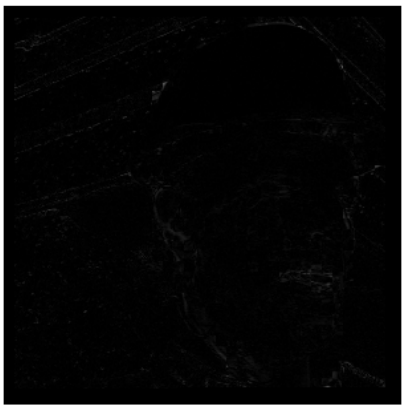
actual residue or difference between frames

reduced residue after the Search Operation



actual residue or difference between frames

reduced residue after the Search Operation

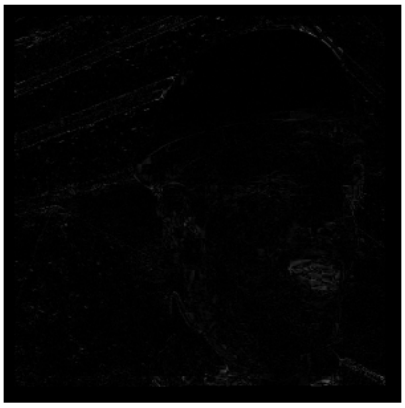


actual residue or difference between frames

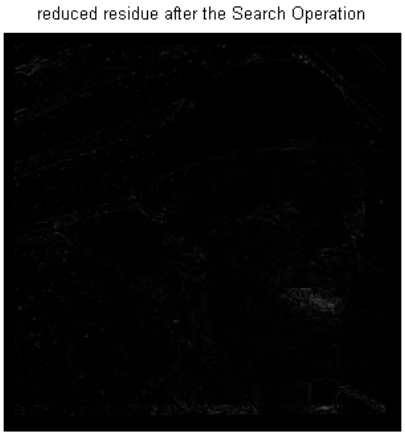
reduced residue after the Search Operation

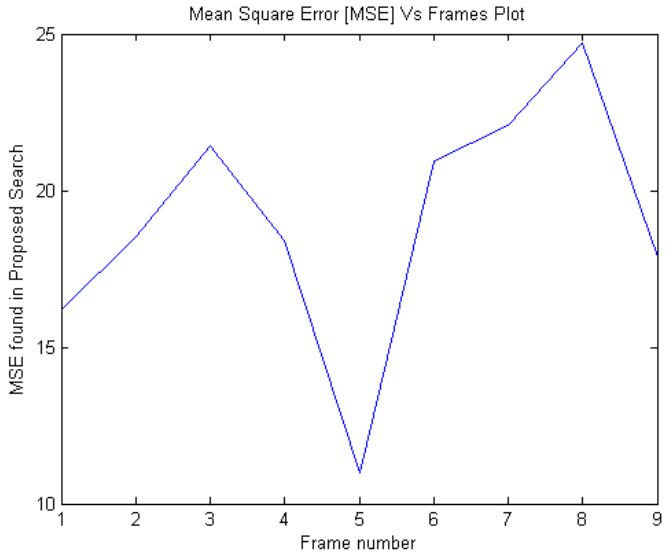
actual residue or difference between frames

reduced residue after the Search Operation



actual residue or difference between frames

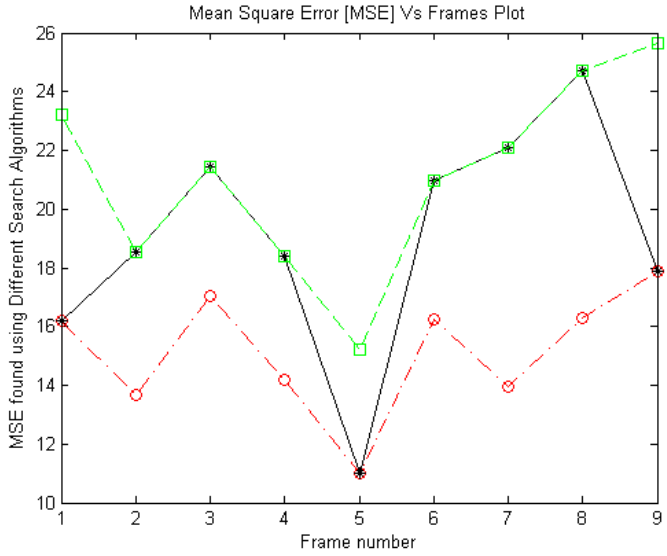


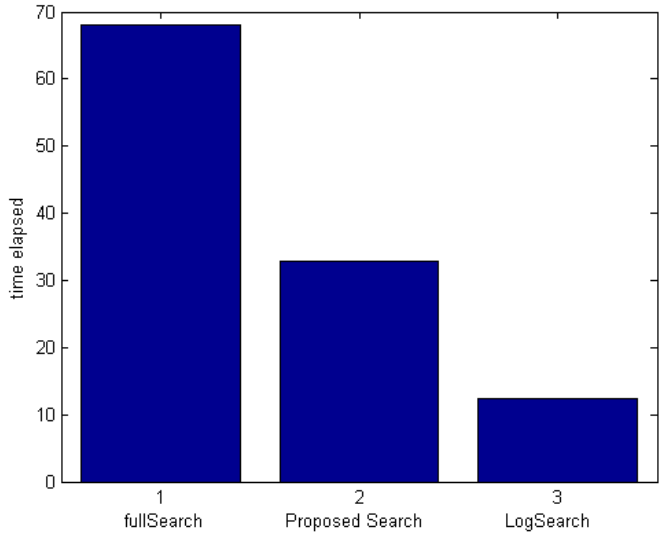


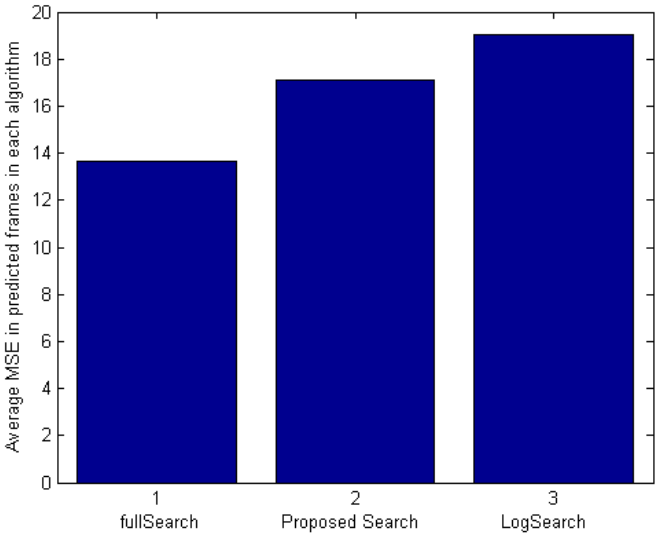
Comparision Among these Search Algorithm

```
figure,plot(Frame,MSE_Full,'r-.o',Frame,MSE_Proposed,'k-*',Frame,MSE_Log,'g--s');
title('Mean Square Error [MSE] Vs Frames Plot');;
ylabel('MSE found using Different Search Algorithms');
xlabel('Frame number');

timeelapsed=[telapsed_full,telapsed_Proposed,telapsed_log];
figure,bar(timeelapsed);
xlabel('fullSearch               Proposed Search              LogSearch');
ylabel('time elapsed');
Av_MSE_Proposed=sum(MSE_Proposed)/10;
Av_MSE_full=sum(MSE_Full)/10;
Av_MSE_Log=sum(MSE_Log)/10;
MsE=[Av_MSE_full,Av_MSE_Proposed,Av_MSE_Log]
figure,bar(MsE);
xlabel('fullSearch               Proposed Search              LogSearch');
ylabel('Average MSE in predicted frames in each algorithm');
```

```
MsE =

   13.6398   17.1130   19.0147
```






Average MSE in predicted frames in each algorithm
20
18
16
14
12
10
8
6
4
2
0
1
fullSearch
2
Proposed Search
3
LogSearch