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CS 754 : Advanced Image Processing - Assignment 1

Karan Taneja - 15D070022

Sucheta Ravikanti- 1600401001

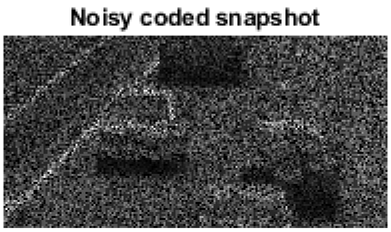
```
clear;
clc;
addpath(genpath('MMread'));
```

2 (a) Loading 'cars' video

```
time_frames = 3; height = 120; width = 240;
cars_video = load_video('./cars.avi', time_frames, height, width);
cars_video = cars_video./255;
```

2 (b) Generating coded snapshot

```
noise = 2/255;
[noisy_coded_snapshot, code_pattern] =
 create_noisy_coded_snapshot( ...
    cars_video,noise);

% showing coded snapshot
imshow(noisy_coded_snapshot/max(noisy_coded_snapshot, [], 'all'));
title("Noisy coded snapshot")
hold off
```



2 (c) What are A, x, and b?

```
% x is the unknown original image of size H.W.T.
% b is the vector of measurements of size H.W (linearized)
% A is the measurement matrix of size (H.W) x (H.W.T)
```

2 (d) (e) patch-wise reconstruction from coded snapshot and code pattern

```
% x is the unknown patch in image of size (patch_size.patch_size.T).
% b is the vector of measurements of size patch_size.patch_size
% (linearized)
% A is the measurement matrix of size (patch_size.patch_size) x ...
%                                     (patch_size.patch_size.T)

patch_size = 8; % patch_stride = patch_size/2;
epsilon = 1e-1;
reconstruction = reconstruct_from_snapshot(noisy_coded_snapshot, ...
    code_pattern, patch_size, epsilon);
```

2 (d) (e) relative mean squared error (rmse)

```
mse = mean((cars_video - reconstruction).^2, 'all');
rmse = mse / mean(cars_video .^ 2, 'all');
fprintf("rmse = %0.4f \n", rmse);

rmse = 0.0211
```

2 (d) (e) plots

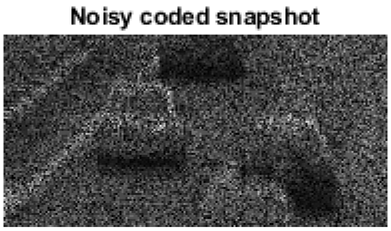
```
for t = 1:time_frames
    figure
    imshow(reconstruction(:,:,1)/max(reconstruction, [], 'all'))
    title(sprintf("Time step = %d", t));
end
```

2 (f) With T = 5

```
time_frames = 5; height= 120; width = 240;
cars_video = load_video('./cars.avi', time_frames, height, width);
cars_video = cars_video./255;

noise = 2/255;
[noisy_coded_snapshot, code_pattern] =
 create_noisy_coded_snapshot( ...
    cars_video,noise);

% showing coded snapshot
imshow(noisy_coded_snapshot/max(noisy_coded_snapshot, [], 'all'));
title("Noisy coded snapshot")
hold off
```

```
patch_size = 8; % patch_stride = patch_size/2;
epsilon = 1e-1;
reconstruction = reconstruct_from_snapshot(noisy_coded_snapshot, ...
    code_pattern, patch_size, epsilon);

mse = mean((cars_video - reconstruction).^2, 'all');
rmse = mse / mean(cars_video .^ 2, 'all');
fprintf("rmse = %0.4f \n", rmse);
```

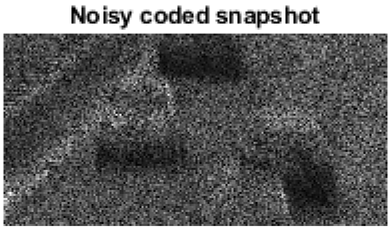
```
rmse = 0.0407
```



2 (f) With T = 7

```
time_frames = 7; height= 120; width = 240;
cars_video = load_video('./cars.avi', time_frames, height, width);
cars_video = cars_video./255;

noise = 2/255;
[noisy_coded_snapshot, code_pattern] =
 create_noisy_coded_snapshot( ...
    cars_video,noise);

% showing coded snapshot
imshow(noisy_coded_snapshot/max(noisy_coded_snapshot, [], 'all'));
title("Noisy coded snapshot")
hold off

patch_size = 8; % patch_stride = patch_size/2;
epsilon = 1e-1;
reconstruction = reconstruct_from_snapshot(noisy_coded_snapshot, ...
    code_pattern, patch_size, epsilon);

mse = mean((cars_video - reconstruction).^2, 'all');
rmse = mse / mean(cars_video .^ 2, 'all');
fprintf("rmse = %0.4f \n", rmse);
```

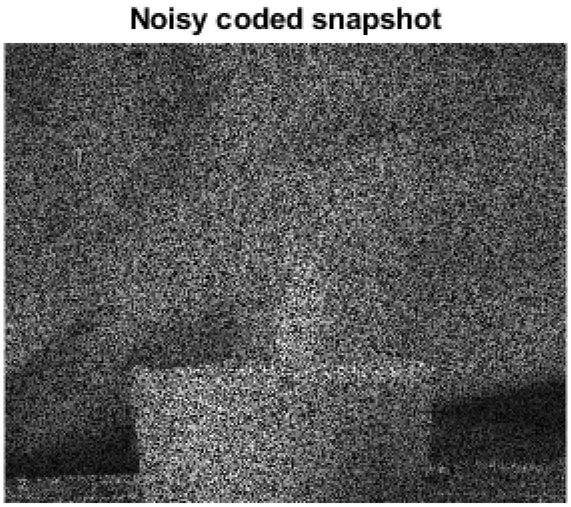
```
rmse = 0.0845
```

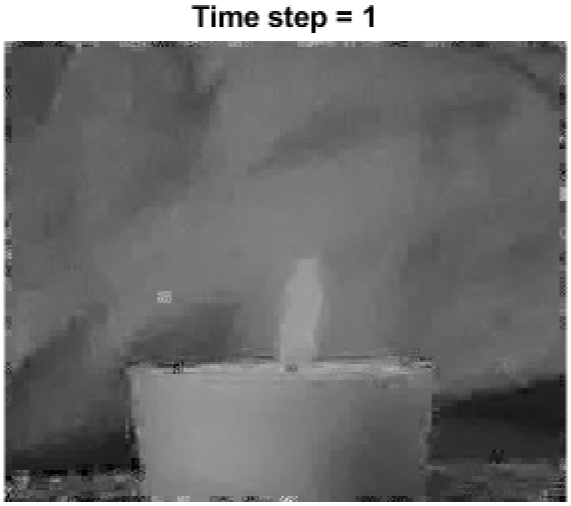


2 (h) With Flame Video

```
time_frames = 5; height= 288; width = 352;
cars_video = load_video('./flame.avi', time_frames, height, width);
cars_video = cars_video./255;

noise = 2/255;
[noisy_coded_snapshot, code_pattern] =
 create_noisy_coded_snapshot( ...
    cars_video,noise);

% showing coded snapshot
imshow(noisy_coded_snapshot/max(noisy_coded_snapshot, [], 'all'));
title("Noisy coded snapshot")
hold off

patch_size = 8; % patch_stride = patch_size/2;
epsilon = 1e-1;
reconstruction = reconstruct_from_snapshot(noisy_coded_snapshot, ...
    code_pattern, patch_size, epsilon);

mse = mean((cars_video - reconstruction).^2, 'all');
rmse = mse / mean(cars_video .^ 2, 'all');
fprintf("rmse = %0.4f \n", rmse);

for t = 1:time_frames
    figure
    imshow(reconstruction(:,:,1)/max(reconstruction, [], 'all'))
    title(sprintf("Time step = %d", t));
end
```

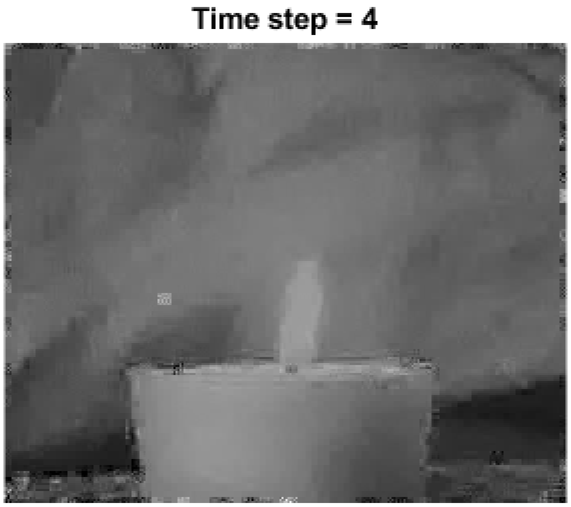
```
rmse = 0.0056
```


Noisy coded snapshot

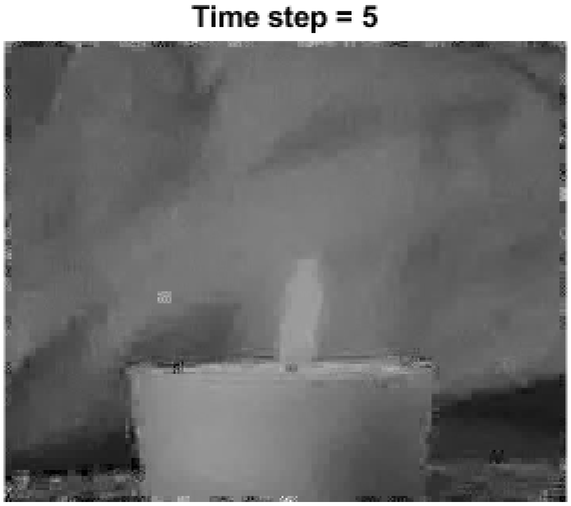

Time step = 1

Time step = 2

Time step = 3



Time step = 4



Time step = 5

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