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```
% Create a Hybrid Image between the (fish) as input#1 and the
 (motorcycle) as input#2.
% 1. First hybrid is the (fish) magnitude with the (motorcycle) phase
% 2. Second hybrid is the (motorcycle) magnitude and the (fish) phase
clear; close all;  clc;
```

Images

```
disp('Open Images');
tic;
im1   = imread('./data/motorcycle.bmp');
im1   = imresize(im1,[360, 410]);
im1   = double(im1)/255;
im1   = rgb2gray(im1);
toc;
tic;
im2   = imread('./data/fish.bmp');
im2   = imresize(im2,[360, 410]);
im2   = double(im2)/255;
im2   = rgb2gray(im2);
toc;
disp('End open images');
```

```
Open Images
Elapsed time is 0.010452 seconds.
Elapsed time is 0.011241 seconds.
End open images
```

Fequency Domain

```
disp(' ');
tic;
disp('fftshits');
F1 = fftshift(fft2(im1));
F2 = fftshift(fft2(im2));
toc;

disp(' ');
tic;
disp('Neutralize Magnitude');
```

```
% Neutralize Magnitude
F1_Mag = abs(F1);
F2_Mag = abs(F2);

toc;
disp(' ');

tic;
disp('Phase');
% Phase
F1_Phase = exp(1i*angle(F1));
F2_Phase = exp(1i*angle(F2));
toc;
disp(' ');
```

```
fftshits
Elapsed time is 0.008460 seconds.

Neutralize Magnitude
Elapsed time is 0.002088 seconds.

Phase
Elapsed time is 0.007451 seconds.
```

Reconstructin

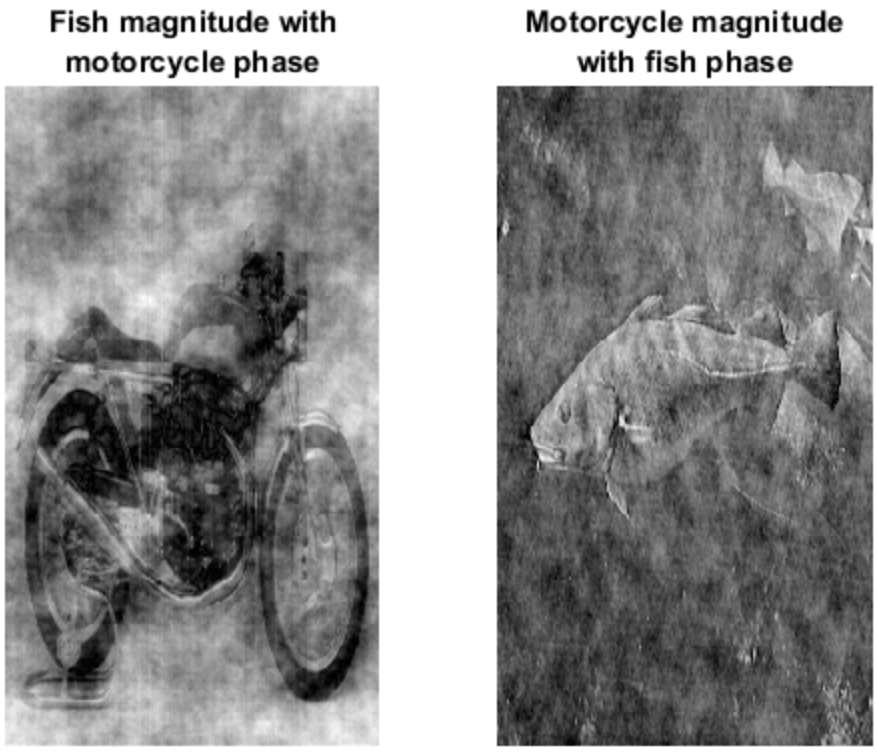
```
tic;
disp('Reconstruct');
Reconstruct1 = log(abs(ifft2(ifftshift(F2_Mag.*F1_Phase)))+1);
Reconstruct2 = log(abs(ifft2(ifftshift(F1_Mag.*F2_Phase)))+1);
toc;
disp(' ');
```

```
Reconstruct
Elapsed time is 0.020154 seconds.
```

Display reconstructed images

```
tic;
disp('Display Images');
figure;
subplot (1,2,1), imagesc(Reconstruct1), colormap gray, axis off,
 title({'Fish magnitude with',  'motorcycle phase'});
subplot (1,2,2), imagesc(Reconstruct2), colormap gray, axis off,
 title({'Motorcycle magnitude', 'with fish phase'});
toc;
```

```
Display Images
Elapsed time is 0.084241 seconds.
```



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```
% Create and show the new image resulting from neutralizing the
 magnitude
% components for each the following input images separately: (dog),
 (Einstein), and
% fish).
clear; close all; clc;
```

Images

```
disp('Display Images');
tic;
im1 = imread('./data/dog.bmp');
im1   = imresize(im1,[360, 410]);
im1   = double(im1)/255;
im1 = rgb2gray(im1);
toc;
im2 = imread('./data/einstein.bmp');
im2   = imresize(im2,[360, 410]);
im2   = double(im2)/255;
im2 = rgb2gray(im2);
toc;



im3 = imread('./data/fish.bmp');
im3   = imresize(im3,[360, 410]);
im3   = double(im3)/255;
im3 = rgb2gray(im3);
toc;
disp(' ');
```

```
Display Images
Elapsed time is 0.016428 seconds.
Elapsed time is 0.024544 seconds.
Elapsed time is 0.033712 seconds.
```

Fequency Domain

```
tic;
```

```
disp('fftshifts');
F1 = fftshift(fft2(im1));
F2 = fftshift(fft2(im2));
F3 = fftshift(fft2(im3));
toc;
disp(' ');
% Neutralize Magnitude
tic;
disp('Neutralize Magnitudes');
F1_Mag = 1;
F2_Mag = 1;
F3_Mag = 1;
toc;
disp(' ');

tic;
disp('Phases');
% Phase
F1_Phase = exp(1i*angle(F1));
F2_Phase = exp(1i*angle(F2));
F3_Phase = exp(1i*angle(F3));

toc;



disp(' ');
```

```
fftshifts
Elapsed time is 0.011513 seconds.

Neutralize Magnitudes
Elapsed time is 0.000113 seconds.

Phases
Elapsed time is 0.008760 seconds.
```

Reconstructin

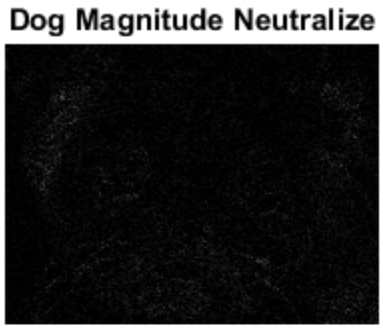
```
tic;
disp('Recontruction');
Reconstruct1 = log(abs(ifft2(ifftshift(F1_Mag.*F1_Phase)))+1);
Reconstruct2 = log(abs(ifft2(ifftshift(F2_Mag.*F2_Phase)))+1);
Reconstruct3 = log(abs(ifft2(ifftshift(F3_Mag.*F3_Phase)))+1);

toc;

disp(' ');
```

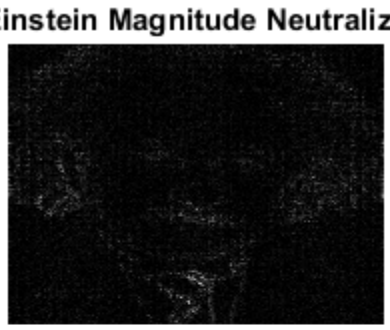
```
Recontruction
Elapsed time is 0.025091 seconds.
```

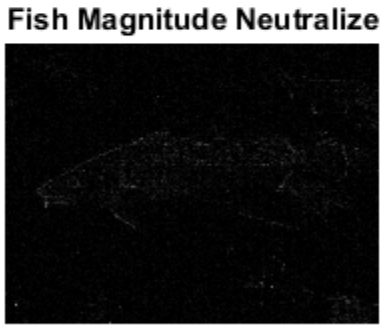
Display reconstructed images

```
tic;
disp('Display Images');
figure;
subplot (2,2,1), imagesc(Reconstruct1), colormap gray, axis off,
 title('Dog Magnitude Neutralize');
toc;
subplot (2,2,2), imagesc(Reconstruct2), colormap gray, axis off,
 title('Einstein Magnitude Neutralize');
toc;
subplot (2,2,3), imagesc(Reconstruct3), colormap gray, axis off,
 title('Fish Magnitude Neutralize');
toc;
```

```
Display Images
Elapsed time is 0.073588 seconds.
Elapsed time is 0.093497 seconds.
Elapsed time is 0.111950 seconds.
```







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```
% Create and show the new image resulting from removing the phase
 components for
% each the following input images separately: (dog), (motorcycle), and
 (submarine).
clear; close all; clc;
```

Images

```
tic;
disp('Display images');
im1 = imread('./data/dog.bmp');
im1   = imresize(im1,[360, 410]);
im1   = double(im1)/255;
im1 = rgb2gray(im1);
toc;

im2 = imread('./data/motorcycle.bmp');
im2   = imresize(im2,[360, 410]);
im2   = double(im2)/255;
im2 = rgb2gray(im2);
toc;

im3 = imread('./data/submarine.bmp');
im3   = imresize(im3,[360, 410]);
im3   = double(im3)/255;
im3 = rgb2gray(im3);
toc;
disp(' ');
```

```
Display images
Elapsed time is 0.011072 seconds.
Elapsed time is 0.020707 seconds.
Elapsed time is 0.042132 seconds.
```

Frequency Domain

```
tic;
disp('Frequency Domain');
F1 = fftshift(fft2(double(im1)));
```

```
F2 = fftshift(fft2(double(im2)));
F3 = fftshift(fft2(double(im3)));
toc;
disp(' ');

% Magnitude
tic;
disp('Magnitude');
F1_Mag = abs(F1);
F2_Mag = abs(F2);
F3_Mag = abs(F3);
toc;
disp(' ');
```

```
Frequency Domain
Elapsed time is 0.012149 seconds.

Magnitude
Elapsed time is 0.002962 seconds.
```

Neutralize Phase

```
tic;
disp('Neutralize Phase');
F1_Phase = exp(1i*0);
F2_Phase = exp(1i*0);
F3_Phase = exp(1i*0);
toc;
disp(' ');
```

```
Neutralize Phase
Elapsed time is 0.000275 seconds.
```

Reconstructin

```
tic;
disp('Reconstruct');
Reconstruct1 = log(abs(ifft2(ifftshift(F1_Mag.*F1_Phase)))+1);
Reconstruct2 = log(abs(ifft2(ifftshift(F2_Mag.*F2_Phase)))+1);
Reconstruct3 = log(abs(ifft2(ifftshift(F3_Mag.*F3_Phase)))+1);
toc;
```

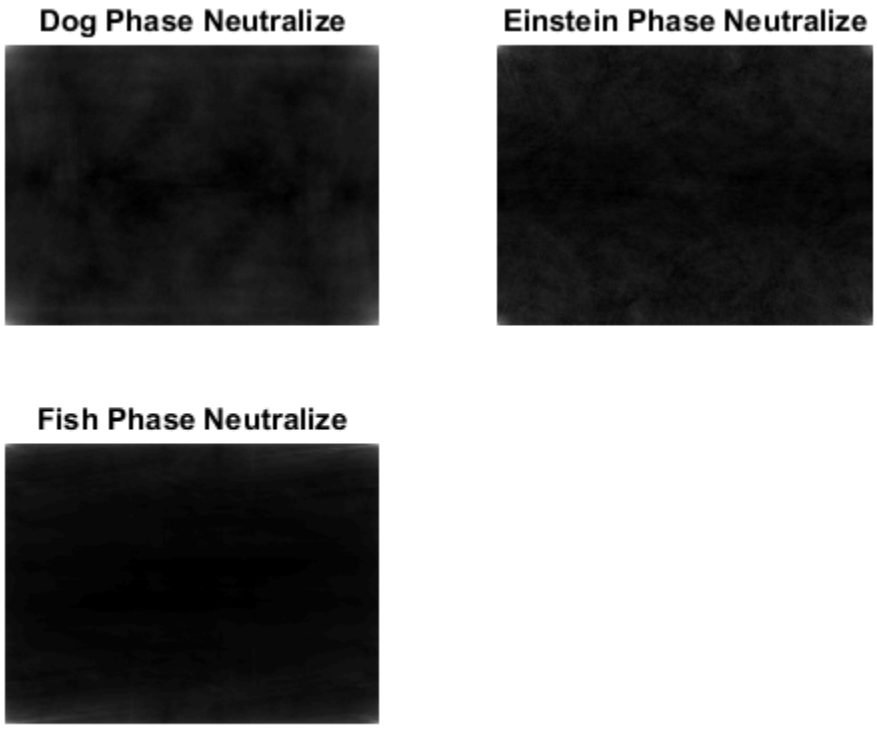
```
Reconstruct
Elapsed time is 0.022922 seconds.
```

Display reconstructed images

```
tic;
disp('Display Final Images');
figure;
```

```
subplot (2,2,1), imagesc(Reconstruct1), colormap gray, axis off,
 title('Dog Phase Neutralize');
toc;
subplot (2,2,2), imagesc(Reconstruct2), colormap gray, axis off,
 title('Einstein Phase Neutralize');
toc;
subplot (2,2,3), imagesc(Reconstruct3), colormap gray, axis off,
 title('Fish Phase Neutralize');
toc;
```

```
Display Final Images
Elapsed time is 0.061337 seconds.
Elapsed time is 0.077263 seconds.
Elapsed time is 0.094900 seconds.
```



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