

%Ideal Low Pass Filters

```
input_image = imread('input17.png');

[M, N] = size(input_image);

FT_img = fft2(double(input_image));
D0 = 30;
u = 0:(M-1);
idx = find(u>M/2);
u(idx) = u(idx)-M;
v = 0:(N-1);
idy = find(v>N/2);
v(idy) = v(idy)-N;
[V, U] = meshgrid(v, u);
D = sqrt(U.^2+V.^2);
H = double(D <= D0);
G = H.*FT_img;
output_image = real(ifft2(double(G)));

subplot(2, 1, 1), imshow(input_image),
subplot(2, 1, 2), imshow(output_image, [ ]);
```



```

%Butterworth Low Pass Filters
[M, N] = size(input_image);

FT_img = fft2(double(input_image));

n = 2;

D0 = 20;

u = 0:(M-1);
v = 0:(N-1);
idx = find(u > M/2);
u(idx) = u(idx) - M;
idy = find(v > N/2);
v(idy) = v(idy) - N;

[V, U] = meshgrid(v, u);

D = sqrt(U.^2 + V.^2);

% determining the filtering mask
H = 1./(1 + (D./D0).^(2*n));
G = H.*FT_img;

output_image = real(ifft2(double(G)));

subplot(2, 1, 1), imshow(input_image),
subplot(2, 1, 2), imshow(output_image, [ ]);

```





`%Gaussian Low Pass Filters`

```
[M, N] = size(input_image);  
  
FT_img = fft2(double(input_image));  
  
D0 = 30;  
u = 0:(M-1);  
idx = find(u>M/2);  
u(idx) = u(idx)-M;  
v = 0:(N-1);  
idy = find(v>N/2);  
v(idy) = v(idy)-N;  
  
[V, U] = meshgrid(v, u);  
  
D = sqrt(U.^2+V.^2);  
  
H = double(D <= D0);  
  
G = H.*FT_img;
```

```

output_image = real(ifft2(double(G)));

subplot(2, 1, 1), imshow(input_image),
subplot(2, 1, 2), imshow(output_image, [ ]);

```



```

% Sharpening

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```

%Ideal Highpass Filter in Image Processing
input_image = imread('input14.png');
[M, N] = size(input_image);
FT_img = fft2(double(input_image));
D0 = 10;

u = 0:(M-1);
idx = find(u>M/2);
u(idx) = u(idx)-M;
v = 0:(N-1);
idy = find(v>N/2);
v(idy) = v(idy)-N;
[V, U] = meshgrid(v, u);

```

```

D = sqrt(U.^2+V.^2);
H = double(D > D0);
G = H.*FT_img;
output_image = real(ifft2(double(G)));
subplot(2, 1, 1), imshow(input_image),
subplot(2, 1, 2), imshow(output_image, [ ]);

```



```

% Butterworth High Pass Filter
[M, N] = size(input_image);
FT_img = fft2(double(input_image));
n = 2;
D0 = 10;
u = 0:(M-1);
v = 0:(N-1);
idx = find(u > M/2);
u(idx) = u(idx) - M;
idy = find(v > N/2);
v(idy) = v(idy) - N;
[V, U] = meshgrid(v, u);
D = sqrt(U.^2 + V.^2);
H = 1./(1 + (D0./D).^(2*n));
G = H.*FT_img;
output_image = real(ifft2(double(G)));
subplot(2, 1, 1), imshow(input_image),
subplot(2, 1, 2), imshow(output_image, [ ]);

```



```
%Gaussian High Pass Filter
[M, N] = size(input_image);

FT_img = fft2(double(input_image));
n = 2;

D0 = 20;

u = 0:(M-1);
v = 0:(N-1);
idx = find(u < M/2);
u(idx) = u(idx) - M;
idy = find(v < N/2);
v(idy) = v(idy) - N;

[V, U] = meshgrid(v, u);

D = sqrt(U.^2 + V.^2);

H = 1./(1 + (D./D0).^(2*n));
G = H.*FT_img;

output_image = real(ifft2(double(G)));
```

```
subplot(2, 1, 1), imshow(input_image),  
subplot(2, 1, 2), imshow(output_image, [ ]);
```

