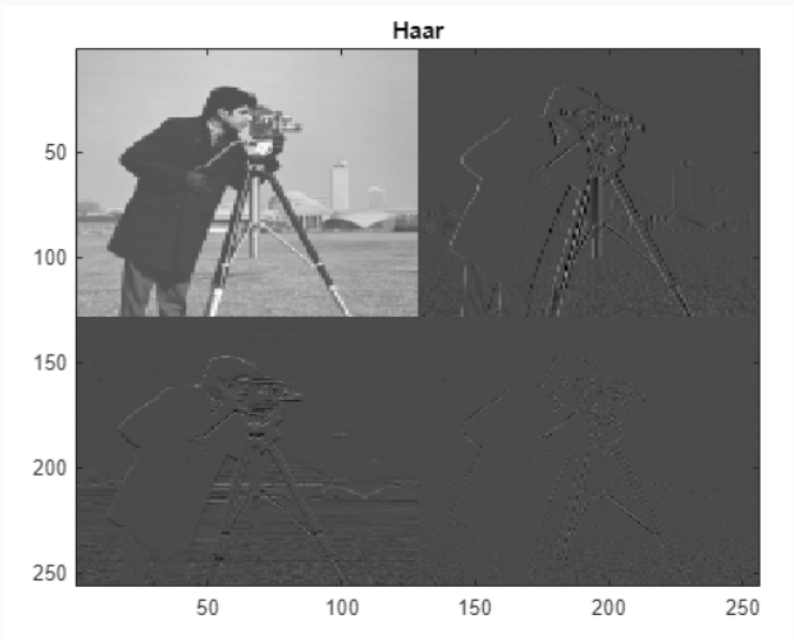
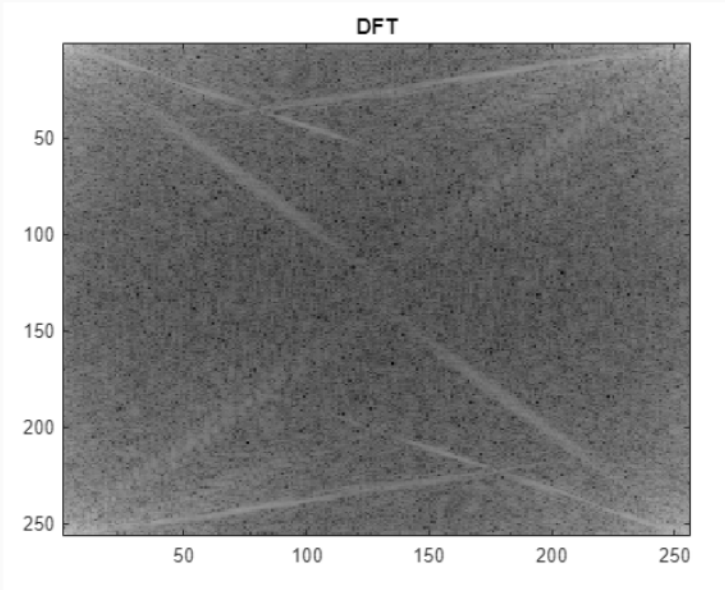


# Image Compression with Haar Transform and Discrete Fourier Transform

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## Implementation

---

```
I=double(imread('cameraman.tif'));
colormap gray;
imagesc(I), title Original
```

```
I_dft=dft2(I);
imagesc(log(abs(I_dft))), title DFT
```

```
I_haar=haar2_L1(I);
imagesc(I_haar), title Haar
```

```
function s=dft(s) % 1D dft
    N=length(s);
    DFT=ones(N);
    for m=1:N-1
        for n=1:N-1
            DFT(m+1,n+1)=cos(-2*pi*m*n/N)+1j*sin(-2*pi*m*n/N);
        end
    end
    s=DFT*s;
end
```

```
function s=dft2(s) % 2D dft
    m=length(s(1,:));
    n=length(s(:,1));

    % apply dft to rows
    for i=1:m
        s(i,:)=dft(s(i,:))';
    end

    % apply dft to columns
    for i=1:n
        s(:,i)=dft(s(:,i));
    end
end
```

```
function W=haar1_L1(x) % 1D level 1 haar transform
    L=length(x);
    W=zeros(L,1);
    L=L/2;
    for n=1:L
        W(n)=(1/sqrt(2))*(x(2*n-1)+x(2*n));
        W(L+n)=(1/sqrt(2))*(x(2*n-1)-x(2*n));
    end
end
```

```
function s=haar2_L1(s) % 2D level 1 haar transform
    m=length(s(1,:));
    n=length(s(:,1));
```

```
% apply single level haart to rows
for i=1:m
    s(i,:)=haar1_L1(s(i,:)')';
end

% apply single level haart to to columns
for i=1:n
    s(:,i)=haar1_L1(s(:,i));
end
end
```