## MATLAB Programs

### Program 1

*Write a program to find frequency contents of speech signal.*

```
%to find frequency contents of speech signal
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
plot(a);title('plot of speech signal');xlabel('sample
number'); ylabel('Amplitude');
b=fft(a);
figure;
c=abs(b);
for i=1:1023,
    d(i)=c(i+1);
end
plot(d);title('plot of frequency contents of speech
signal');xlabel('DFT coefficient number');
ylabel('Amplitude');
```

**Output**

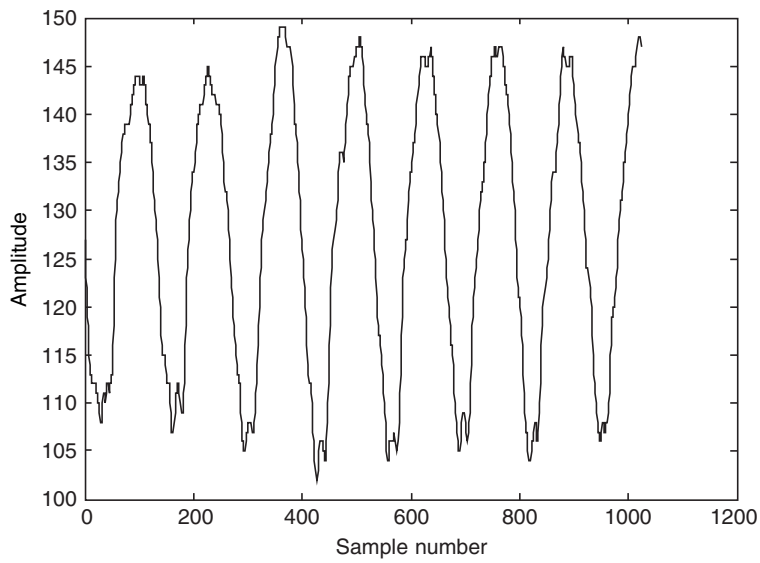


**Figure 1** Plot of speech signal using DFT.

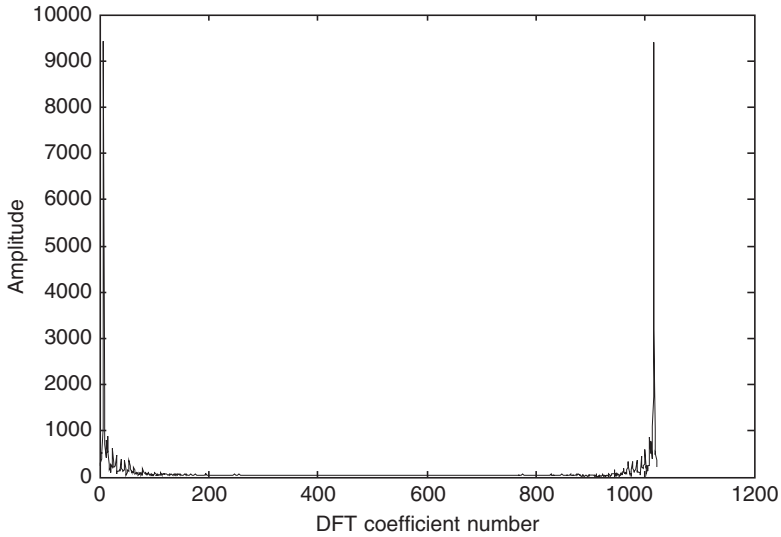


**Figure 2** Plot of speech signal spectrum using DFT.

## Program 2

*Write a program to find frequency contents of speech signal and correlation for DFT output.*

```
%to find frequency contents of speech signal and correlation
for DFT output
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
plot(a);title('plot of speech signal');xlabel('sample
number'); ylabel('Amplitude');
for i=1:256,
    a1(i)=a(i);
end
for i=257:512,
    a2(i-256)=a(i);
end
disp(corrcoef(a1,a2));
b=fft(a);
figure;
c=abs(b);
for i=1:1023,
    d(i)=c(i+1);
end
```

```
plot(d);title('plot of frequency contents of speech
signal');xlabel('DFT coefficient number');
ylabel('Amplitude');
for i=1:255,
    d1(i)=d(i);
end
for i=257:511,
    d2(i-256)=d(i);
end
disp(corrcoef(d1,d2));
```

**Output**

Refer Figure 2 of Program 1.

Correlation for DFT output is 0.0840 very small as compared to correlation for speech samples which is equal to 0.8304.

## Program 3

*Write a program to find frequency contents of speech signal using DCT.*

```
%to find frequency contents of speech signal using DCT
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
plot(a);title('plot of speech signal');xlabel('sample
number'); ylabel('Amplitude');
for i=1:256,
    a1(i)=a(i);
end
for i=257:512,
    a2(i-256)=a(i);
end
disp(corrcoef(a1,a2));
c=dct(a);
figure;
for i=1:1023,
    d(i)=c(i+1);
end
plot(d);title('plot of frequency contents of speech
signal');xlabel('DCT coefficient number');
ylabel('Amplitude');
```

```
for i=1:256,
    d1(i)=d(i);
end
for i=257:512,
    d2(i-256)=d(i);
end
disp(corrcoef(d1,d2));
```

**Output**

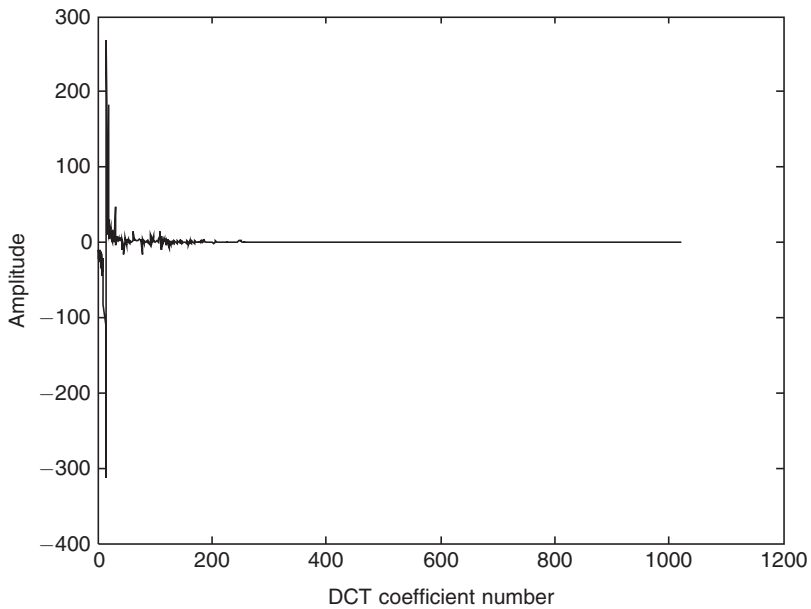


**Figure 3** Plot of spectrum of speech signal using DCT.

## Program 4

*Write a program to find frequency contents of speech signal using DST.*

```
%to find frequency contents of speech signal using DST
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
plot(a);title('plot of speech signal');xlabel('sample
number'); ylabel('Amplitude');
for i=1:256,
    a1(i)=a(i);
end
```

```
for i=257:512
    a2(i-256)=a(i);
end
disp(corrcoef(a1,a2));
c=dst(a);
figure;
for i=1:1023,
    d(i)=c(i+1);
end
plot(d);title('plot of frequency contents of speech
signal');xlabel('DST coefficient number');
ylabel('Amplitude');
for i=1:256,
    d1(i)=d(i);
end
for i=257:512,
    d2(i-256)=d(i);
end
disp(corrcoef(d1,d2));
```

**Output**

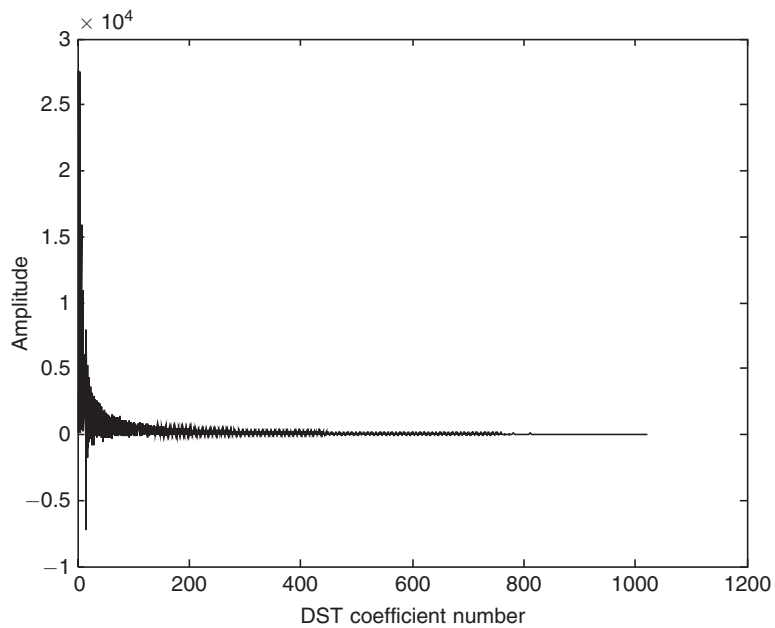


**Figure** 4 Plot of spectrum of speech signal using DST.

## Program 5

*Write a program to centre shift the DFT output.*

```
%to centre shift the DFT output
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
c=fft(a);
figure;
for i=1:1023,
    d(i)=c(i+1);
end
c1=fftshift(d);
plot(abs(c1));title('plot of frequency contents of speech signal after centre shifting');xlabel('DFT coefficient number'); ylabel('Amplitude');
```

### Output

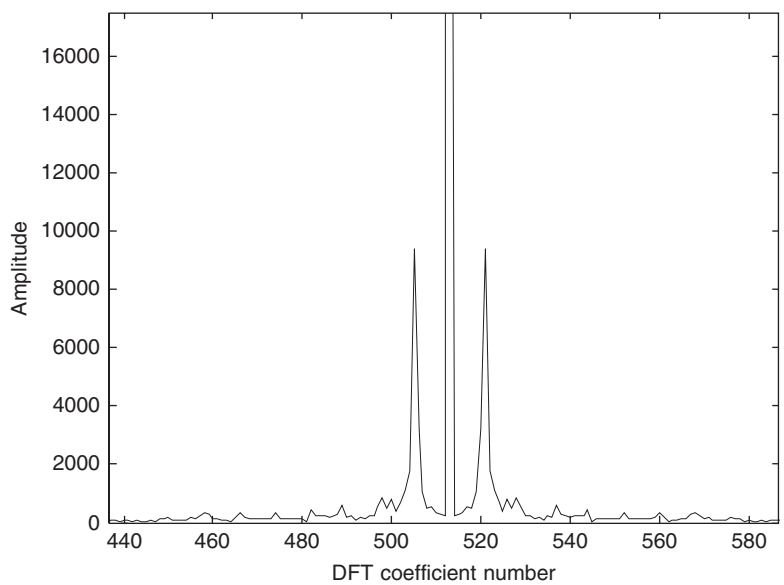


**Figure 5** DFT magnitude plot after center shifting (we have zoomed onto points between 440 and 580).

## Program 6

*Write a program to filter the speech signal in DFT domain using center shifting DFT output.*

```
%to filter the speech signal in DFT domain using centre
shifting DFT output
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
c=fft(a);
c1=fftshift(c);
plot(abs(c1));title('plot of frequency contents of speech
signal after centre shifting');xlabel('DFT coefficient
number'); ylabel('Amplitude');
for i=480:544,
    d1(i)=c1(i);
end
for i=1:479,
    d1(i)=0;
end
for i=545:1024,
    d1(i)=0;
end
figure;
plot(abs(d1));title('plot of frequency contents of speech
signal after lPF(rectangular window between 480 to
544)');xlabel('DFT coefficient number');
ylabel('Amplitude');
d2=ifftshift(d1);
disp(d2);
d3=ifft(d2);
figure;
plot(abs(d3));title('plot of low pass filtered speech
signal');xlabel('sample number'); ylabel('Amplitude');
```

## Output

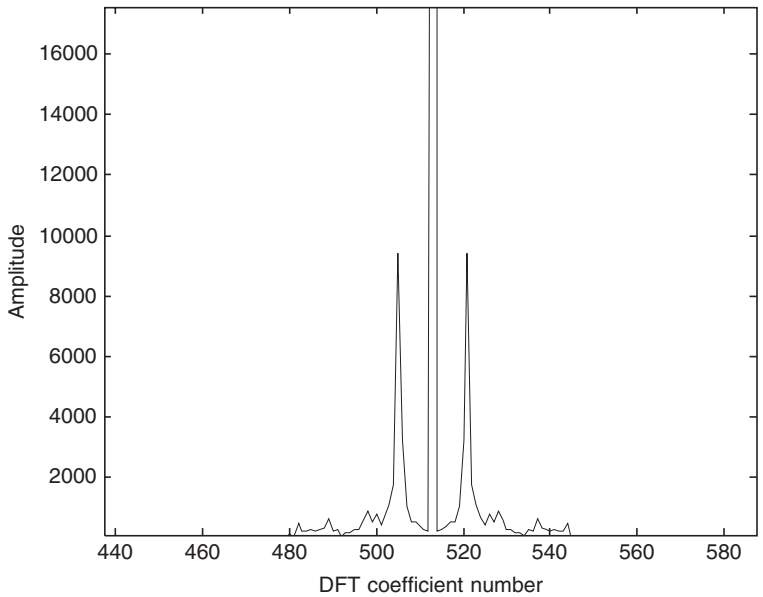


**Figure 6** DFT output after passing via a rectangular window (we have zoomed onto points between 440 and 580).

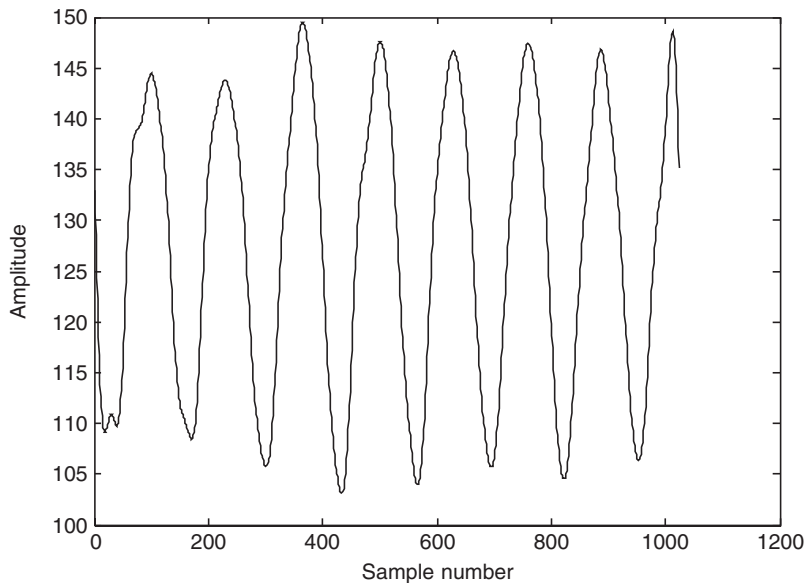


**Figure 7** Low-pass filtered speech signal (filtering in DFT domain).

## Program 7

*Write a program to filter speech signal in DCT domain.*

```
%to filter speech signal in DCT domain
clear all;
fp=fopen('watermark.wav','r');
fseek(fp,44,-1);
a=fread(fp,1024);
c=dct(a);
plot(c);title('plot of frequency contents of speech signal
in DCT domain');xlabel('DFT coefficient number');
ylabel('Amplitude');
for i=1:104,
    d1(i)=c(i);
end
for i=105:1023,
    d1(i)=0;
end
figure;
plot(d1);title('plot of frequency contents of speech signal
after lPF window to pass 1 to 104 DCT samples)');xlabel('DFT
coefficient number'); ylabel('Amplitude');
d3=idct(d2);
figure;
plot(d3);title('plot of low pass filtered (DCT domain) speech
signal');xlabel('sample number'); ylabel('Amplitude');
```

**Output**

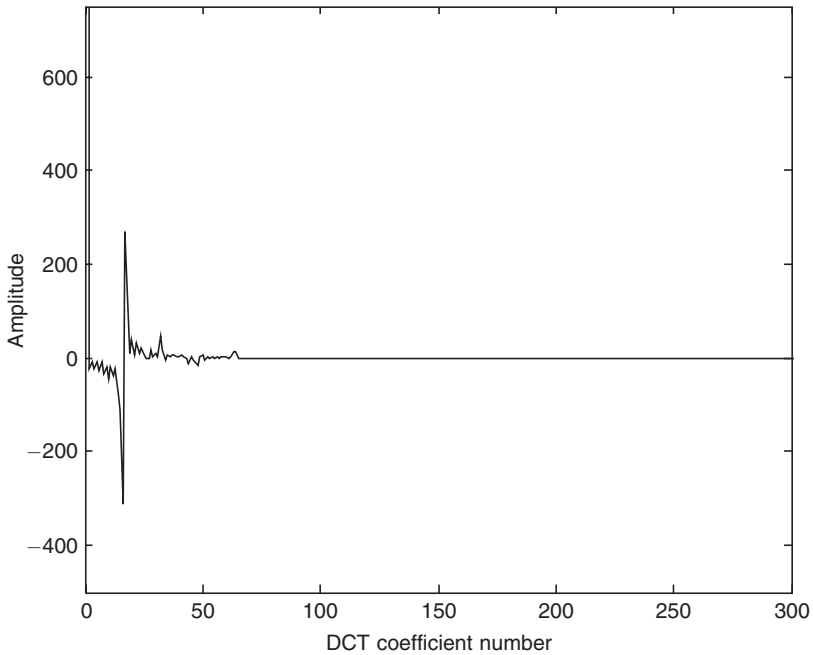


**Figure 8** Plot of DCT output after passing via a window of length 64 (we have zoomed onto first 300 samples of DCT).

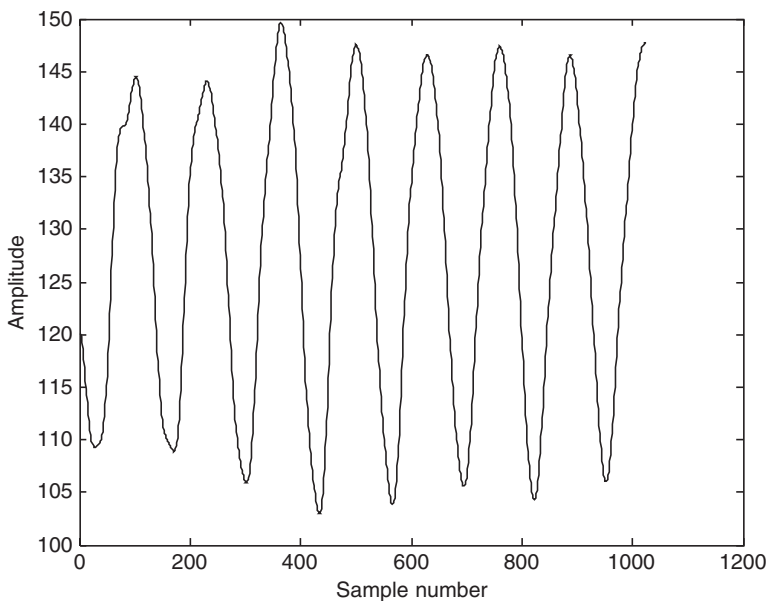


**Figure 9** Low-pass filtered speech signal (filtering in DCT domain).