ADSP

LAB – 10 : IF Estimation

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EXERCISES

Question) Instantaneous Frequency

1) Plot a speech signal

2) Calculate it's IF

3) Unwrap phase of hilbert

4) Plot IF graph

CODE

1)

```
% 202411012

% 1) Plotting the speech signal

[x, Fs] = audioread('BAK.wav');   % Load your speech signal
x = x(:,1);                       % Use one channel if stereo
t = (0:length(x)-1)/Fs;

figure;
```
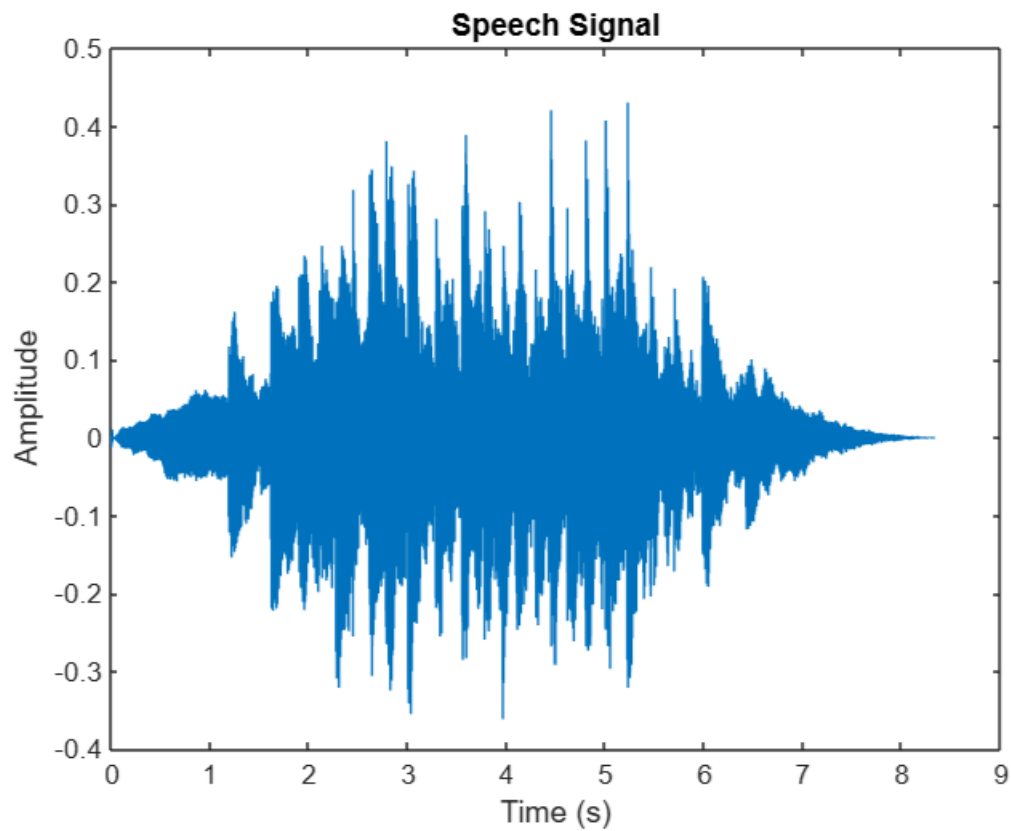
```matlab
plot(t, x);
xlabel('Time (s)'); ylabel('Amplitude');
title('Speech Signal');
```


2)

```matlab
% 2) Computing Instantaneous Frequency (IF)

analytic_signal = hilbert(x);
inst_phase = unwrap(angle(analytic_signal));  % Step 3
inst_freq = diff(inst_phase) * Fs / (2*pi);   % Step 2 (derivative of phase)
t_if = t(1:end-1);  % Because diff reduces length by 1
```

3)

```matlab
% 3) Plotting the unwrap phase

figure;
plot(t, inst_phase);
xlabel('Time (s)'); ylabel('Phase (rad)');
title('Unwrapped Phase of Hilbert Transform');
```
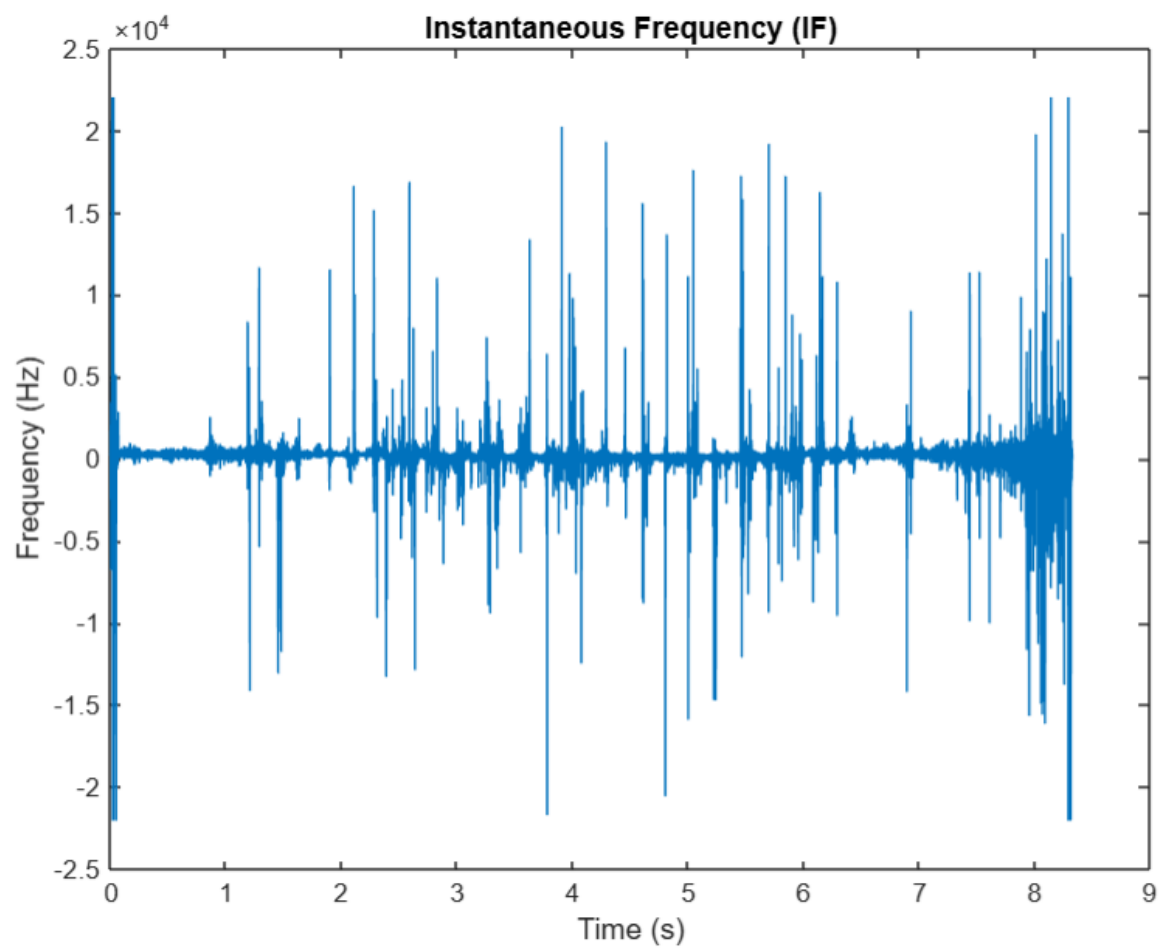
Unwrapped Phase of Hilbert Transform

4)

```
% 4) Plot Instantaneous Frequency

figure;
plot(t_if, inst_freq);
xlabel('Time (s)'); ylabel('Frequency (Hz)');
title('Instantaneous Frequency (IF)');
```

Instantaneous Frequency (IF)