Experiment 03

Experiment : DTMF(Dual Tone Multifrequency or TouchTone) coder / decoder

Objective : Study and Analysis of DTMF (Dual Tone Multifrequency, or TouchTone) coder / decoder using Digital FIR Filter in MATLAB.

At The end Of this experiment ,You ll learn about

(a) Functionality of DTMF and it's different applications.

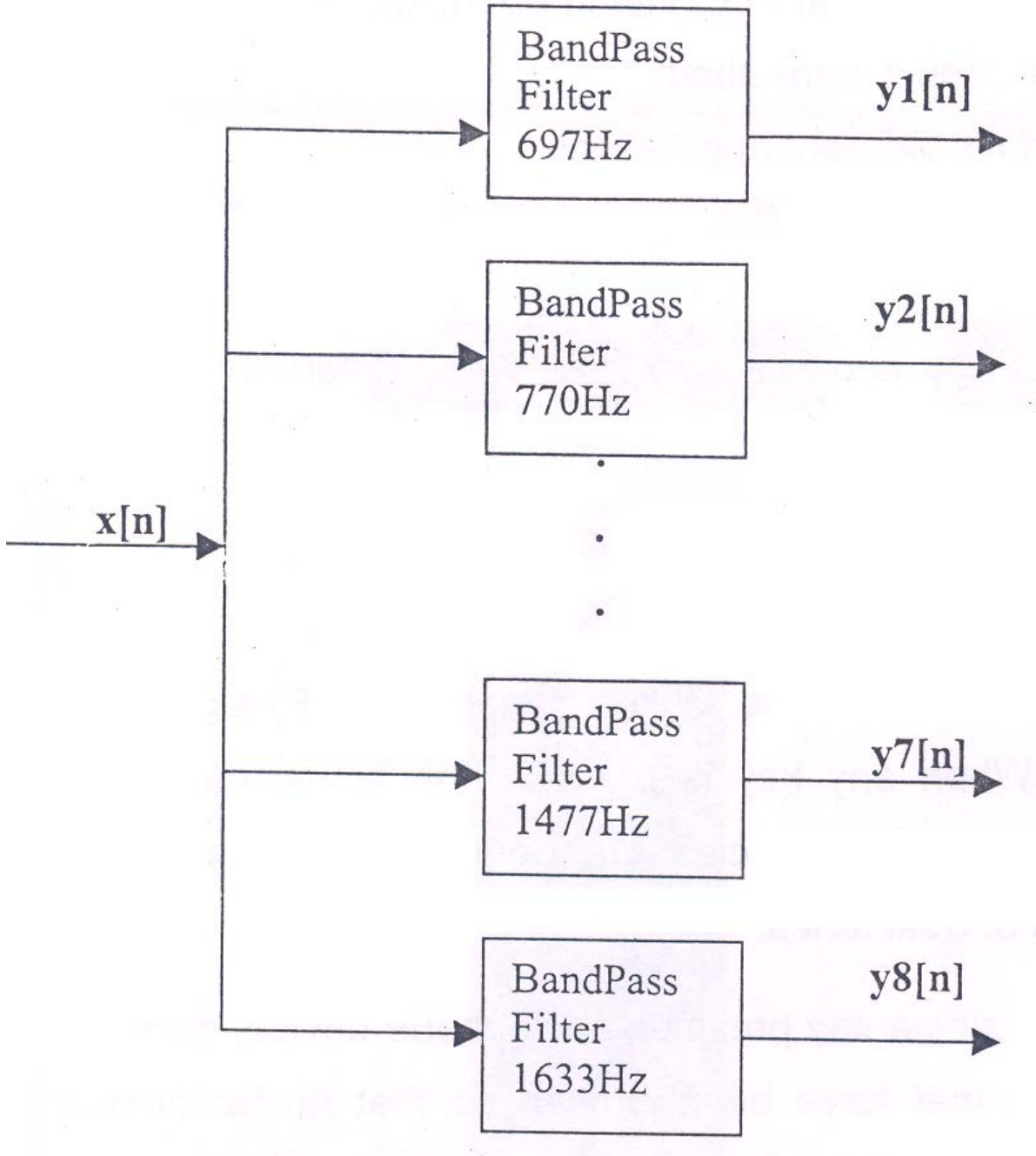
(b) Implementation of BandPass Digital Filters.

(c) DTMF Coder/Decoder.

(d) How to characterize a filter by knowing how it reacts to different frequency components in the input.

Hz	1209	1336	1477	1633
697	1	2	3	A
770	4	5	6	B
852	7	8	9	C
941	*	0	#	D

Encoding


BandPass
Filter
697Hz
y1[n]
BandPass
Filter
770Hz
y2[n]
x[n]
BandPass
Filter
1477Hz
y7[n]
BandPass
Filter
1633Hz
y8[n]

Decoding

BPF: Moving Average LPF then Frequency Shift

DTFT Property studied before:

$$e^{j\omega_0 n}x[n] \xleftrightarrow{\mathcal{F}} X(e^{j(\omega-\omega_0)})$$

$$h[n] = \beta\cos(\hat{w}c*n) \text{ where } 0 \le n < L.$$

Where L is the filter length, and $\hat{w}c$ is the center frequency that defines the frequency location of the pass band and β is used to adjust the gain in the pass band. So it is possible to choose β so that the maximum value of the frequency response magnitude will be one. The Band width of the band pass filter is controlled by L; The larger the value of L, the narrower the band width.

Noise performance: Before it gets decoded encoded signal is corrupted with noise

You may additionally compare performance of BPF scheme mentioned here and discussed in theory class.

Graphical User Interface: Not Mandatory

Bonus credit which can be used for shortfall in any other place.