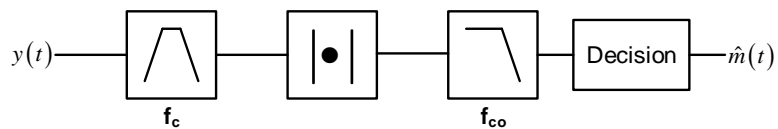


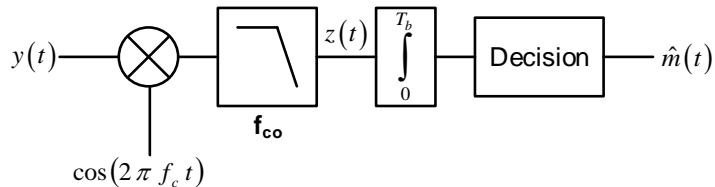


ASK Demodulation

Incoherent Demodulation: Envelope Detector

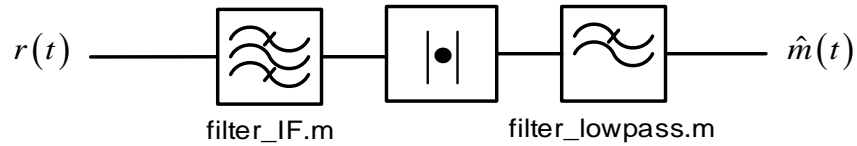


Coherent Demodulation: Synchronous Receiver.



Coherent must align with the phase of the carrier!

ASK Incoherent Demodulation in Software



```

fs = XX; % sampling frequency of the ASK signal
fc_low = YY; % Low-frequency cutoff of IF Filter
fc_high = YZ; % High-frequency cutoff of IF Filter
fco = Rs; % cutoff frequency for the LPF (symbol rate)

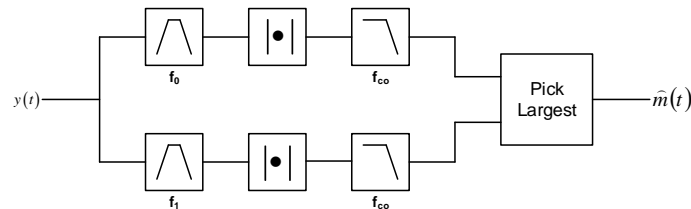
% Perform ASK Demod using Envelope Detection.
ask_filt = filter_IF(data,fc_low,fc_high,fs); % IF Filter
ask_abs = abs(x_filt); % Envelope Detector
ask_demod = filter_lowpass(x_abs,fco,fs_scope); % LPF Filter

% If necessary, downsample to the bitrate (watch out for bit sync!)
fs_rb = fs./downsample_rate;
x_bb = downsample(ask_demod, downsample_rate);
    
```

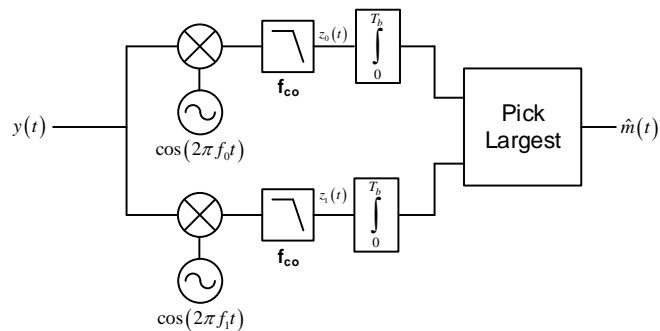
3

FSK Demodulation

Incoherent Demodulation: Filter Bank Receiver

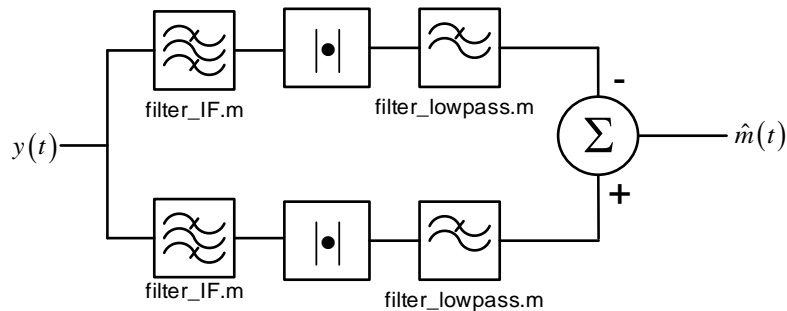


Coherent Demodulation: Array of Synchronous Receivers.



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FSK Demodulation in Software



% FSK Demodulation - First establish major parameters

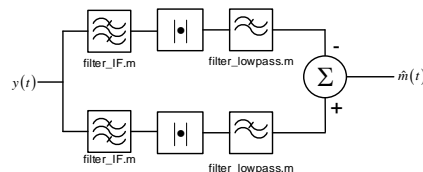
```

fs = XX; % sampling frequency of the FSK signal
f_s0_low = YY; % Low-frequency cutoff of IF Filter Signal S0
f_s0_high = YZ; % High-frequency cutoff of IF Filter Signal S0
f_s1_low = XX; % Low-frequency cutoff of IF Filter Signal S1
f_s1_high = XZ; % High-frequency cutoff of IF Filter Signal S1

fco = Rs; % cutoff frequency for the low pass filter (symbol rate)
    
```

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FSK Demodulation in Software



% Perform FSK Demod using Envelope Detection.
% IF Filter, the envelope detect, then LPF both signals.

```

s0_filt = filter_IF(data,f_s0_low,f_s0_high,fs);
s1_filt = filter_IF(data,f_s1_low,f_s1_high,fs);
s0_abs = abs(s0_filt);
s1_abs = abs(s1_filt);
s0_demod = filter_lowpass(s0_abs,fco,fs);
s1_demod = filter_lowpass(s1_abs,fco,fs);
    
```

% Generate the bits

```
fsk_demod = s1_demod - s0_demod;
```

% If necessary, downsample to the bitrate (watch out for bit sync!)

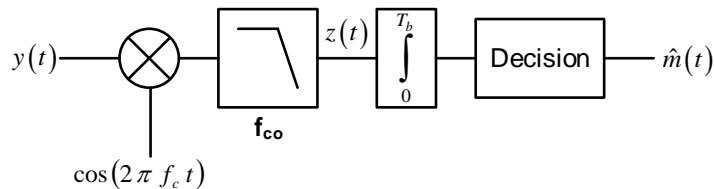
```

fs_rb = fs./downsample_rate;
x_bb = downsample(fsk_demod, downsample_rate);
    
```

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PSK Demodulation

Coherent Demodulation Only: Synchronous Receiver.



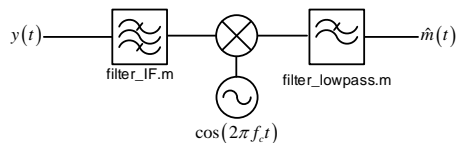
Why? Information is contained in the phase. Incoherent receivers only recover the amplitude!

Note 1: Must align with the phase of the carrier!

Note 2: Receiver must know which phase is associated with which symbol (training sequence)

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BPSK Demodulation in Software



```
fs_scope = 1e6; % sampling frequency of the ASK signal
fco = Rb; % cutoff frequency for the low pass filter (Bit Rate)
% Will need to downsample the recovered signal to an audio-
% level sampling frequency for output to sound card.
downsample_rate = floor(fs_scope./Rb);

% Perform PSK Demod, use LPF to approximate Integration operation.
% Could also use intdump.m function (Integrate and dump).
LO = cos(2*pi*fc.*time); % create LO signal
bpsk_mixed = bpsk.*LO; % Mix signal with local oscillator
bpsk_demod = filter_lowpass(bpsk_mixed, fco, fs_scope);

% Downsample to audio sampling frequency
fs_rb = fs./downsample_rate;
x_bb = downsample(bpsk_demod, downsample_rate);
```

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