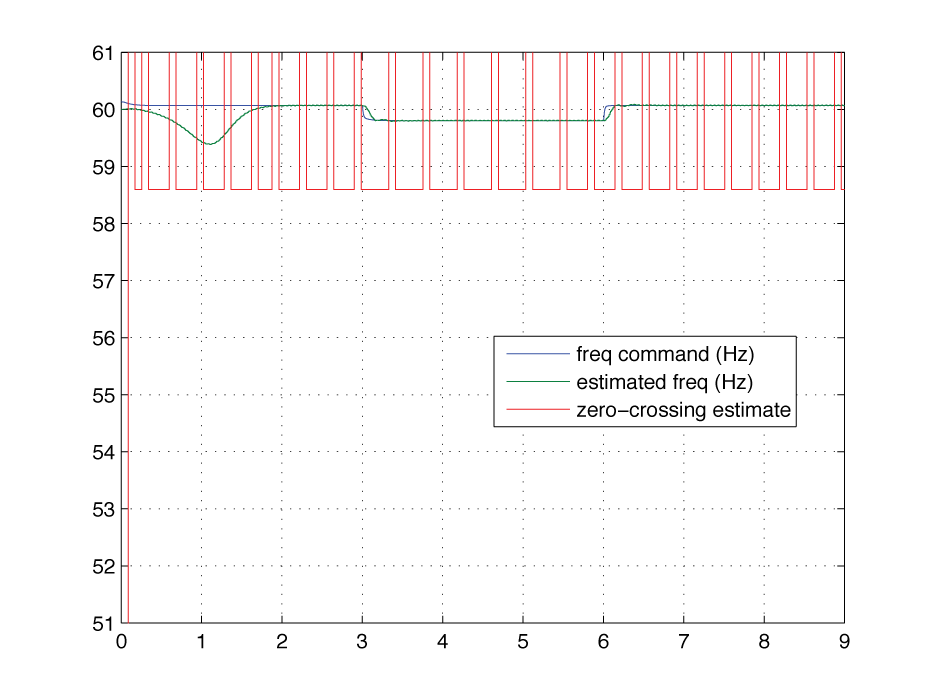
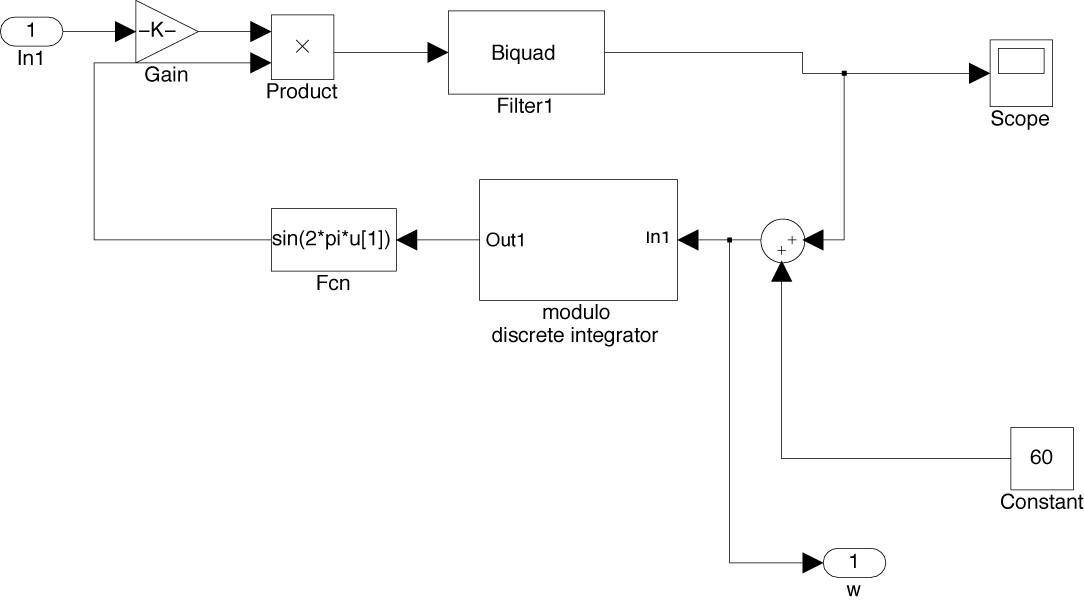
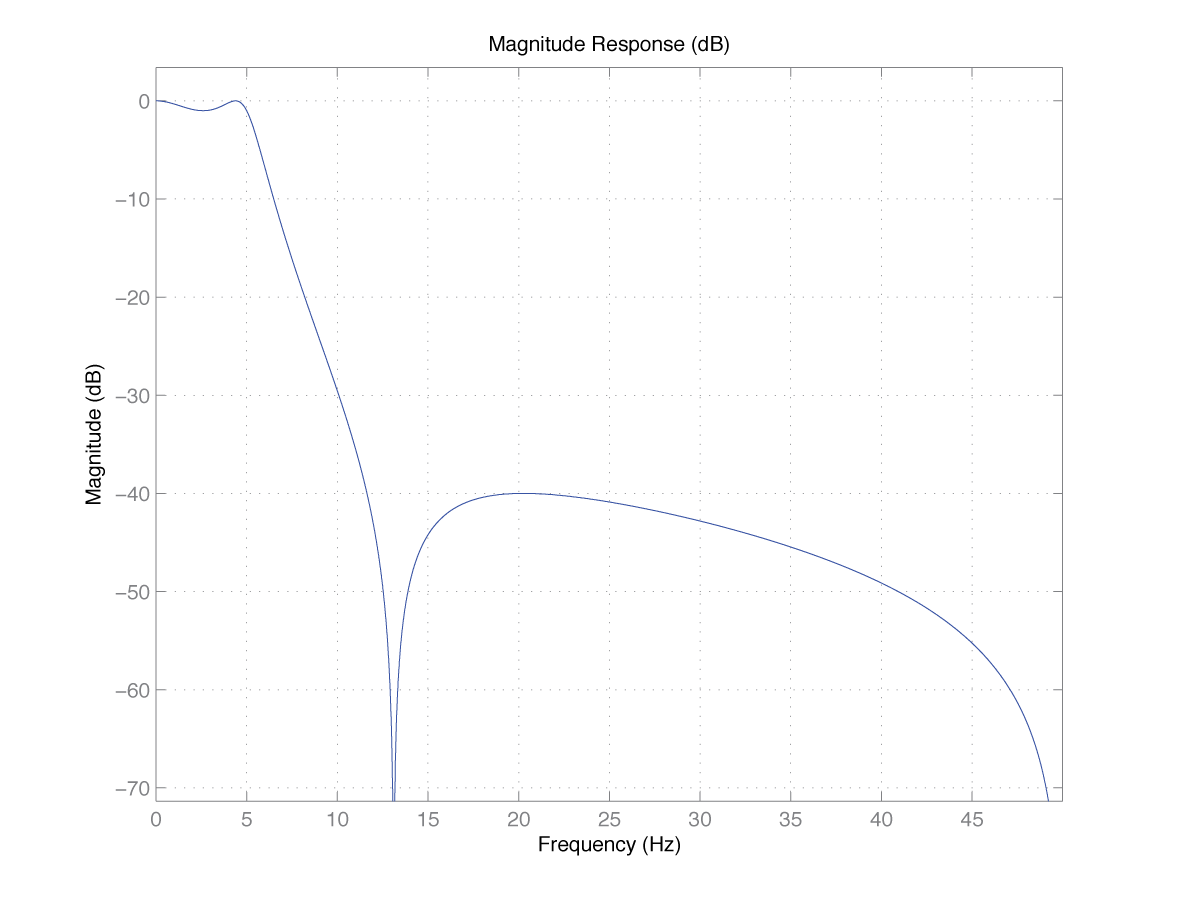
**Frequency Detector**

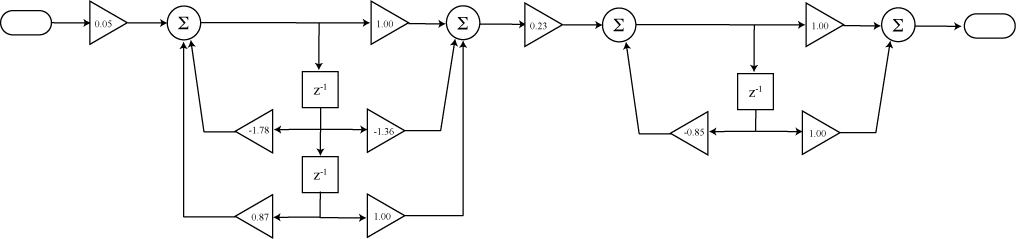
The frequency detector originally used by Odyssian is based on counting zero-crossings over a fixed interval of time. This approach to frequency estimation generates extremely course estimates of the frequency as shown in the following figure. In this simulation, the zero-counting frequency detector was implemented using an S-function that sampled the input at 0.01/60 seconds, counting the zero countings over a window of 512 samples.

A better approach for the frequency estimator uses a phase-locked loop to estimate the phase shift between the input signal and a reference 60 Hz oscillator. The following block diagrams show the simulink model for the frequency detector.



The discrete-time system shown above assuming a 10msec (.01) sampling interval. The main component to be designed here is the lowpass filter. In this case we designed a digital low pass filter with the frequency characteristic shown below. This was implemented as a direct form 2 biquad filter using the coefficients listed below.



­%

% Generated by MATLAB(R) 7.10 and the Signal Processing Toolbox 6.13.

%

% Generated on: 02-Feb-2011 18:28:11

%

% Coefficient Format: Decimal

% Discrete-Time IIR Filter (real)

% -------------------------------

% Filter Structure : Direct-Form II, Second-Order Sections

% Number of Sections : 2

% Stable : Yes

% Linear Phase : No

SOS matrix:

1 -1.3589 1

1 -1.7768 0.8687

1 1 0

1 -0.8468 0

Scale Values:

0.0483

0.2273

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

