Ultrasound System Model

We model each portion of one our dimensional system T as being linear:

$$T\{V\}[n] = (h_{trans} * h_{phantom}(z) * h_{trans}) * V[n] = h_T * V[n]$$

where z is the depth at which we assume the beam is focused.

We are interested in the impact of clutter from other beams. We would like to know the exact form of this clutter, but for now assume that we can specify arbitrary clutter that is received along with the actual signal:

$$T\{V\}[n] = C[n] + (h_{trans} * h_{phantom}(z) * h_{trans}) * V[n] = h_T * V[n]$$

where $C[n]$ is the clutter.

We assume the system is causal, and as such the system output will be zero for $n < 0$.

Decoding Model

We decode by correlating with the original signal sent out, adding the results from a transmit pair, and then enveloping:

$$R[n] = T\{V_1[n]\} \star V_1[n] + T\{V_2[n]\} \star V_2[n]$$

This is the "raw" decoded data. We get the final decoded data by taking the Hilbert transform H and then taking the absolute value:

$$F[n] = \left|H\{R[n]\}\right|$$