THE GORDON RAMSAY DE-BLEEPER

Who? Gordon Ramsay: Irascible
Hosts: 9 TV series about restaurants.
Uses: Language unacceptable for US TV.
But: OK for European TV (evidently).

Given: (Presumably) naughty words “bleeped.”
Goal: Analyze and filter out the “bleeps.”
Warning: I wouldn’t want to shock your virgin ears.

“BLEEP”-ING ANALYSIS [1/2]

Goal: Compute spectrum of Gordon Ramsay snippet.

Use:

\[ [X, Fs] = \text{wavread}('gordon'); \text{soundsc}(X, Fs) \]
\[ N = \text{length}(X); F = [0:N/2-1]*Fs/N; FX = 2*\text{fft}(X)/N; \]
\[ \text{subplot}(211), \text{plot}(F, \text{abs}(FX(1:N/2))) \]
\[ K = \text{round}([951:1050]*N/Fs); \]
\[ \text{subplot}(212), \text{plot}(F(K), \text{abs}(FX(K))) \]

Get: \[ Fs = 11025 \text{ SAMPLE/SECOND}; N = 7000; 7000/11025 = 0.635 \text{ sec.} \]

“BLEEP”-ING ANALYSIS [2/2]

ELIMINATING THE “BLEEP” [1/3]

Get: “Bleep” is a short segment of a 1000 Hz sinusoid.
But: Spectrum mostly zero outside 950 < |f| < 1050 Hz.
So: We set that portion of the spectrum to zero using:
\[ \text{FX}([K\ N+2-K]) = 0; \text{soundsc} (\text{real}(\text{ifft}(FX)), Fs) \]
Where: \( K \) is the range of indices for 950 < |f| < 1050 Hz.
Result: Works. But this is not real-time signal processing.
So: Can’t use to watch real-time reality TV un-bleeped.

ELIMINATING THE “BLEEP” [2/3]

Or: Use a MA notch filter \[ h[n] = \{1, -2\cos(2\pi 1000/Fs), 1\} \]
\[ H = [1 -2*\cos(2*\pi*1000/Fs) 1]; Y2 = \text{conv}(X, H); \]
But: Can barely hear, due to endpoints (see upper figure)
So: Set these endpoints to zero (see lower figure) using:
\[ Y2([1 2 3501 3502]) = 0; \text{soundsc}(Y2, Fs) \]
Result: Works. Now, this IS real-time signal processing.
So: Can use to watch real-time reality TV un-bleeped.

ELIMINATING THE “BLEEP” [3/3]

Y2. Upper: Endpoints present. Lower: Endpoints set to 0.
Note: Gordon is not saying, “bug off” (sounds like it, though).