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.

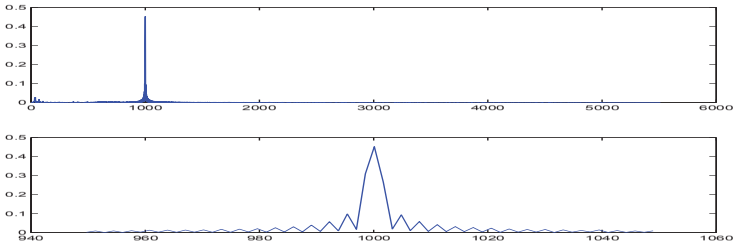
"BLEEP"-ING ANALYSIS [1/2]

Goal: Compute spectrum of Gordon Ramsay snippet.

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

Get: `Fs`=11025$\frac{\text{SAMPLE}}{\text{SECOND}}$; `N`=7000; $\frac{7000}{11025}$=0.635 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:
```
FX([K N+2-K])=0;soundsc(real(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 $h[n]=\{\underline{1}, -2\cos(2\pi\frac{1000}{Fs}), 1\}$
```
H=[1 -2*cos(2*pi*1000/Fs) 1];Y2=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;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).