Lab Project
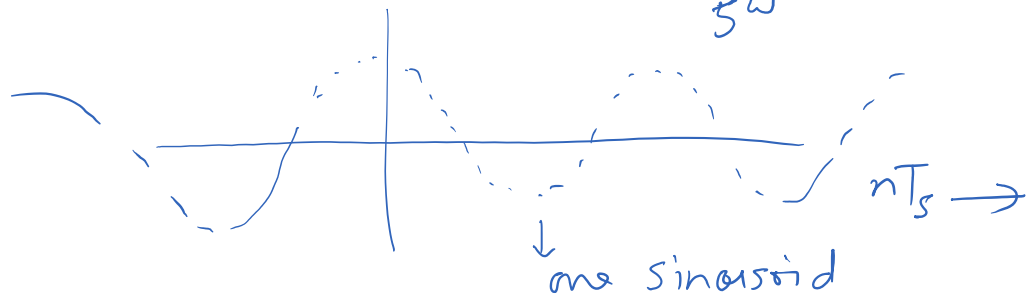
1. Generate a signal
$$x(t) = A \cos \omega_1 t + B \cos \omega_2 t$$
as $x(n)$ by sampling it at 5 times $\max(\omega_1, \omega_2)$.
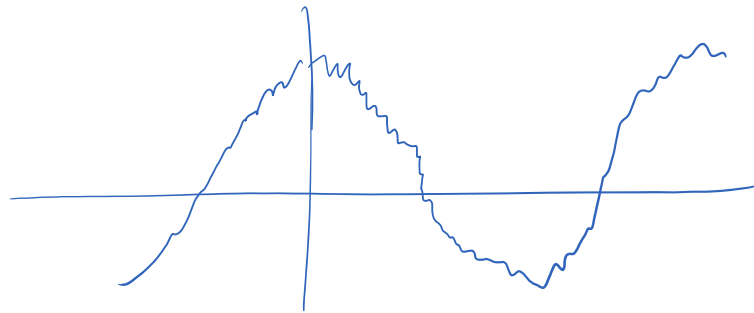$$T_S = \frac{2\pi}{5\omega} \times 5$$

one sinusoid

$nT_S \rightarrow$

$$N = \text{Total data size} = 10 \text{ cycles}$$

2. Add some noise to $x(n)$.
$$\hat{x}(n) = x(n) + \sigma \times \text{rand}\left(-\tfrac{1}{2}, \tfrac{1}{2}\right)$$
$$\underline{\underline{\text{noise power}}}$$

Select $\sigma \ll |A|$ or $|B|$

3. Do filtering

$h(n)$

$\frac{1}{M}$

0 $M-1$
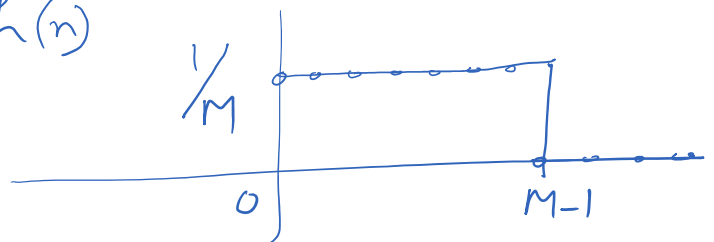
4. observe & comment
   a) Repeat filtering by varying 'M'.
   b) Repeat experiment by varying σ also

c) Replace $h(n)$ by

$$\sum \text{sum} = 1$$

and change M and compare the results with that of $q(a)$.

d) Replace $h(n)$ by

$$h(n) = \delta(n) + p\left(\delta(n) - \delta(n-1)\right)$$
$$= (1+p)\,\delta(n) - p\,\delta(n-1)$$
$$0 < p < 1$$

observe what happens by varying p.

5. Collect your speech signal for 10 sec. Then use the above filters and play back the sound. Explain what you observe.

(or)

Take a picture (good quality); and repeat (5).