

EE526S05 Example Low Pass Filter

$$H(s) = (1/Cs)/(R+1/cs) = 1/(RCs + 1) = 1/(\alpha s + 1) = (1/\alpha)/(1 + 1/\alpha), \quad \alpha = RC$$

$$FS := 960 \quad fco := 60 \quad T := \frac{1}{FS} \quad \alpha := \frac{1}{2 \cdot \pi \cdot fco}$$

$$Kd := \frac{1}{1 + \alpha \cdot \frac{2}{T}} \quad Kd = 0.164$$

$$\alpha d := \frac{\left(1 - \alpha \cdot \frac{2}{T}\right)}{\left(1 + \alpha \cdot \frac{2}{T}\right)} \quad \alpha d = -0.672$$

$$f := 60 \quad N := \frac{FS}{f} \quad n := 0..(5 \cdot N) - 1$$

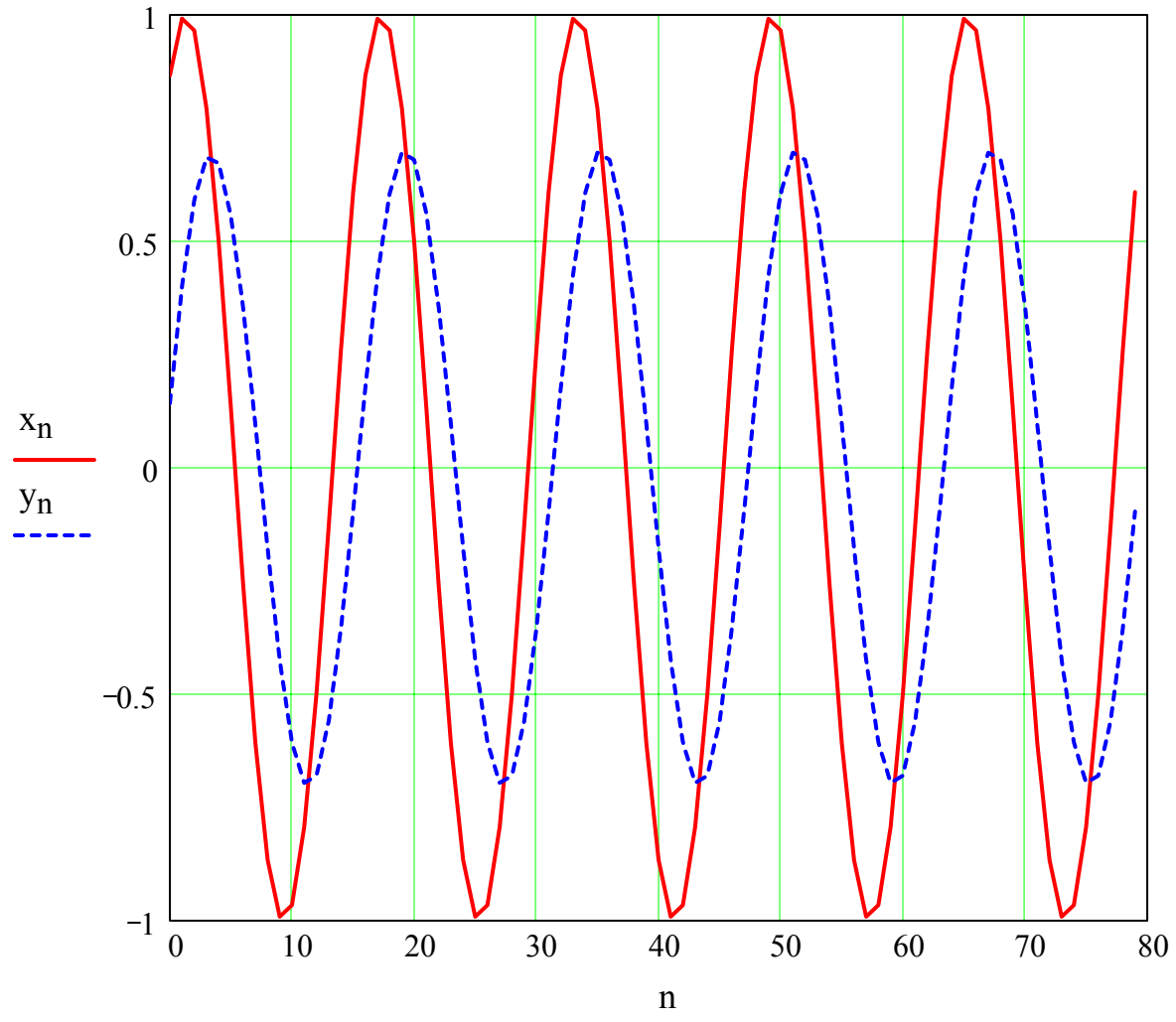
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digitalfilter(x) :=
  Nx ← rows(x)
  for n ∈ 0..Nx
    yn ← 0
  for n ∈ 0..Nx - 1
    sum ← Kd·xn
    sum ← sum + Kd·xn-1 - αd·yn-1 if n > 0
    yn ← sum
  return y

```

$$x_n := \sin\left(2 \cdot \pi \cdot n \cdot 60T + \frac{\pi}{3}\right)$$

$$y := \text{digitalfilter}(x)$$



$$\underline{N} := 128 \quad k := 0..N - 1$$

(Avoids divide by zero error)

$$z_k := e^{-i \cdot (2 \cdot \pi) \cdot \frac{k}{N}} \quad w_k := \left(\text{FS} \cdot \frac{k + 0.0001}{N} \right)$$

$$\underline{Hz}_k := \text{Kd} \cdot \frac{(1 + z_k)}{1 + \alpha d \cdot z_k}$$

$$\text{Hzm}_k := \log(|Hz_k|)$$

$$\text{Pz}_k := \text{atan2}(\text{Im}(Hz_k), \text{Re}(Hz_k)) \cdot \frac{180}{\pi}$$

First Order Low Pass

