Contents

1 Mean Filter

1.1 Moving Average

$$y_k = \frac{1}{N} \sum_{n=0}^{N-1} x_{k-n}$$

$$y_k = \frac{1}{N} x_k + y_{k-1} - \frac{1}{N} x_{k-N}$$

$$y_k = y_{k-1} + \frac{1}{N} \left(x_k - x_{k-N} \right)$$

$$y_k = \frac{1}{N} \sum_{n=0}^{N-1} x_{k-n}$$

$$y_k = \frac{1}{N} x_k + y_{k-1} - \frac{1}{N} x_{k-N}$$

$$y_k = \frac{1}{N} x_k + y_{k-1} \frac{N-1}{N}$$

$$y_k = y_{k-1} + \frac{1}{N} \left(x_k - y_{k-1} \right)$$

1.2 PT1-Filter

$$Y_{(s)} = \frac{K}{1 + Ts} \, X_{(s)}$$

$$Y_{(s)} + T \, s \, Y_{(s)} = K \, X_{(s)} \quad \circ\!\!-\!\!\bullet \quad y_{(t)} + T \, \dot{y}_{(t)} = K \, x_{(t)}$$

$$y_k + T \, \frac{y_k - y_{k-1}}{dt} = K \, x_k$$

$$y_k + \frac{dt}{T} \, y_k = y_{k-1} + K \, \frac{dt}{T} \, x_k$$

$$y_k = \frac{T}{T + dt} \, y_{k-1} + K \, \frac{dt}{T + dt} \, x_k$$

$$\frac{T}{T + dt} \, y_{k-1} = y_{k-1} - \frac{dt}{T + dt} \, y_{k-1}$$

$$y_k = y_{k-1} + \frac{dt}{T + dt} \, \left(K \, x_k - y_{k-1} \right)$$

$$y_k = y_{k-1} + \frac{dt}{T + dt} \, (K \, x_k - y_{k-1})$$

$$K = 1$$
$$\frac{dt}{T + dt} = \frac{1}{N}$$

$$y_k = y_{k-1} + \frac{1}{N} \, (x_k - y_{k-1})$$