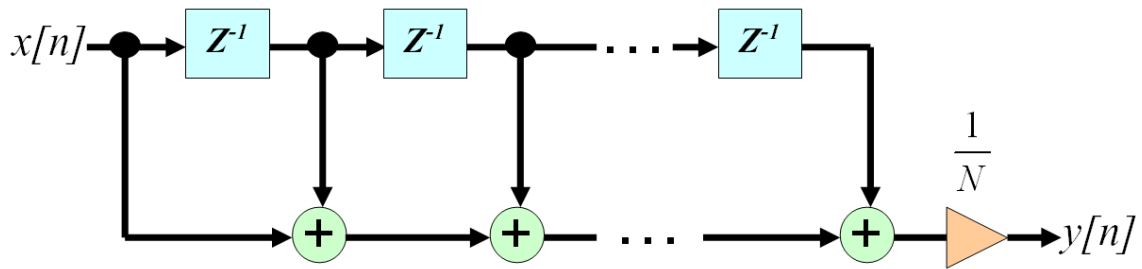


# 【移動平均 Moving Average】



$N$  サンプル移動平均

差分方程式:  $y[n] = \frac{1}{N} \sum_{k=0}^{N-1} x[n-k]$

伝達関数:  $H(z) = \frac{1}{N} \sum_{k=0}^{N-1} z^{-k}$

周波数特性:  $|H(\omega)| = \left| \frac{1}{N} \sum_{k=0}^{N-1} z^{-k} \right|_{z=\exp(j\omega T)} = \frac{1}{N} \left| \frac{1 - e^{-jN\omega T}}{1 - e^{-j\omega T}} \right| = \frac{1}{N} \left| \frac{\sin(\frac{N\omega T}{2})}{\sin(\frac{\omega T}{2})} \right|$

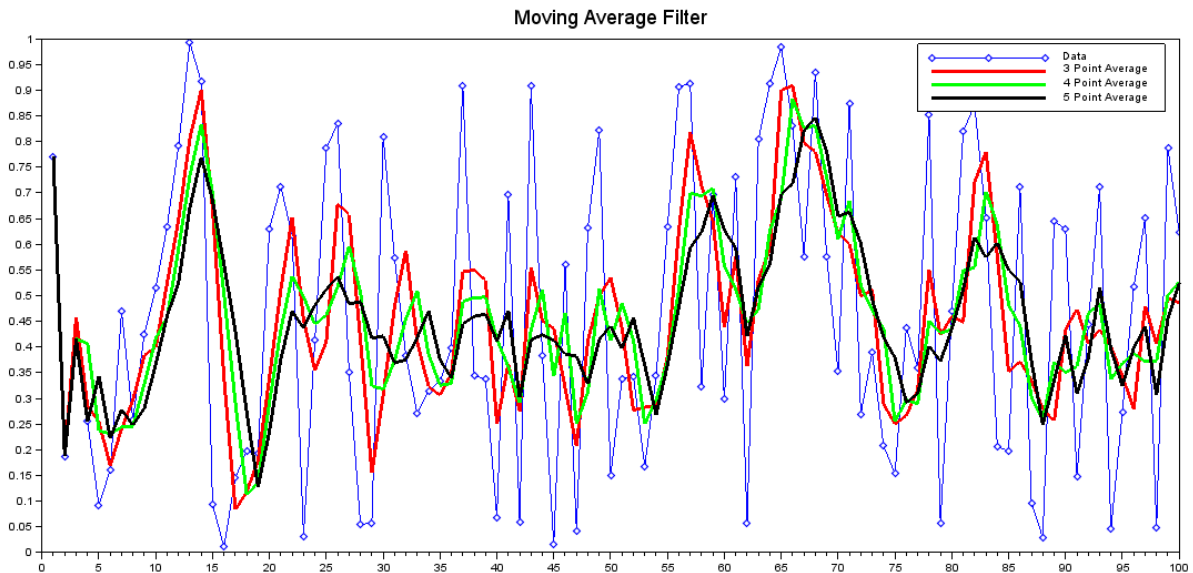


Figure 1: Scilab 実行結果  
3, 4, 5 サンプル移動平均

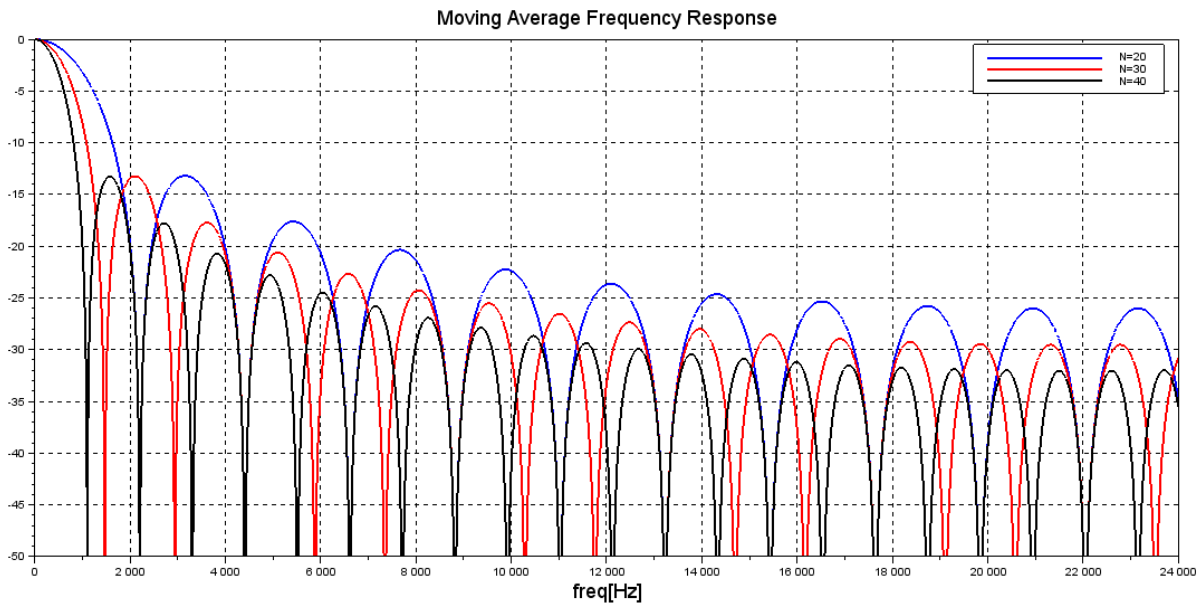


Figure 2: Scilab 実行結果  
移動平均 (N=20, 30, 40) 周波数特性

Source Code 1: Scilab

```

////////////////////////////////////
//      移動平均
//      Moving Average
//
//              M.Tsutsui
////////////////////////////////////

clear;

funcprot(0);
function[y]=maf(smp_n);//smp_n: サンプル数

    y=zeros(1,d_size);

    for k=1:1:smp_n-1;
        y(k)=data(k);
    end

    for k=smp_n:1:d_size;
        y(k)=1/smp_n*sum(data(k-(smp_n-1):k));
    end

endfunction

//__データ定義__//
d_size=100;//データサイズ
data=rand(1,d_size);//データ
//data=sin(linspace(0,d_size,d_size))+rand(1,d_size)-rand(1,d_size); //sin波+Noise

plot(data,'bd-');
a=gce();
c=a.children;
c.thickness = 1;

```

```

plot(maf(3), 'r');
a=gce();
c=a.children;
c.thickness = 3;

plot(maf(4), 'g');
a=gce();
c=a.children;
c.thickness = 3;

plot(maf(5), 'k');
a=gce();
c=a.children;
c.thickness = 3;
legend(['Data','3PointAverage','4PointAverage','5PointAverage']);
title('MovingAverageFilter', 'fontsize',4);

```

### Source Code 2: Python

```

#-----
# Module Name:Moving Average
# Author: m_tsutsui
#-----

#Library_Import-----
from numpy import*
import math, numpy as np
import matplotlib.pyplot as plt
#-----

def MAF(smp_n):

    y=np.zeros(d_size)

    for k in np.arange(0,smp_n-1,1):
        y[k]=data[0,k]

    for m in np.arange(smp_n,d_size,1):
        y[m]=1/smp_n*sum(data[0,m-(smp_n-1):m])

    return y

if __name__ == '__main__':

    d_size=100 #data size
    data=np.random.rand(1,d_size)-np.random.rand(1,d_size) #data

#_Plot-----
plt.figure(facecolor='w')
plt.plot(data.T, "b-")
plt.plot(MAF(3), "r", linewidth=3)
plt.plot(MAF(4), "c", linewidth=3)
plt.plot(MAF(5), "m", linewidth=3)

plt.legend(('Data', '3PointAverage', '4PointAverage', '5PointAverage'))
plt.title('MovingAverageFilter')
plt.grid()

plt.show()

```