

作业一

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1.convOperation.m文件—卷积实现函数

```
function [y, ny] = convOperation(x, nx, h, nh)
nyBegin = nx(1) + nh(1);
nyEnd = nx(length(x)) + nh(length(h));
ny = [nyBegin : nyEnd];
[h, nh] = sigfold(h, nh);
y = zeros(1, length(ny));
k=1;
for i = nyBegin : nyEnd
    [hTemp, nTemp] = sigshift(h, nh, i);
    [temp,nTemp] = sigmult(x, nx, hTemp, nTemp);
    y(k) = sum(temp);
    k = k + 1;
end
function [y,n]=sigfold(x,n)
y=fliplr(x);
n=-fliplr(n);
function [y,n] = sigshift(x,m,n0)
n = m+n0;
y=x;
function [y,n] = sigmult(x1,n1,x2,n2)
n = min( min(n1), min(n2) ) : max( max(n1), max(n2) );
y1 = zeros( 1, length(n) ); y2=y1;
y1( find( ( n >= min( n1 ) ) & ( n <= max( n1 ) ) == 1 ) )
= x1;
y2( find( ( n >= min( n2 ) ) & ( n <= max( n2 ) ) == 1 ) )
= x2;
y = y1 .* y2;
```

2.convolution.m 文件—计算卷积与互相关

```
close all;clc;clear;
%定义 x(n)与 h(n), 以及下标
x=[3,7,5,-1,2];
nx=-3:1;
h=[4,-1,2,3];
nh=0:3;
%计算卷积 y(n)=x(n)*h(n)
[y, ny]=convOperation(x, nx, h, nh);
isequal(y,conv(x,h))
%计算互相关 y1(n)=x(n)*h(-n)
h=fliplr(h);
```

```

nh=-fliplr(nh);
[y1, ny1]=convOperation(x, nx, h, nh);
%绘制图像
subplot(4,1,1);stem(nx,x);title('x(n)');
subplot(4,1,2);stem(nh,h);title('h(n)');
subplot(4,1,3);stem(ny, y);title('卷积 y1(n)');
subplot(4,1,4);stem(ny1, y1);title('互相关 y2(n)');

```

3. 结果

$x=[3,7,5,-1,2]$; $h=[4,-1,2,3]$;

卷积结果: $y(n)=x(n)*h(n)=[12 \quad 25 \quad 19 \quad \underline{14} \quad 40 \quad 11 \quad 1 \quad 6]$

互相关结果: $y1(n)=x(n)*h(-n)=[9 \quad 27 \quad 26 \quad \underline{12} \quad 27 \quad 25 \quad \underline{-6} \quad 8]$

注: 下划线处下标为 0

图形如下图所示:

