practica1SIS

October 10, 2019

1 SENYALS I SISTEMES: PRÀCTICA 1

1.1 Preparació de merdes

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.signal import convolve
import pandas as pd
```

[2]:
```
def myconvolve(x, h):
    N = x.size
    M = h.size
    P = M - 1 #Modify this line
    x_padded = np.concatenate((np.zeros(P), x, np.zeros(P)))
    L = M + N - 1
    y = np.zeros(L)
    h_rev = h[::-1]
    for n in range(L):
        y[n] = np.sum(x_padded[n:n+M]*h_rev)
    return y
```

[3]:
```
def plot3(i, nx, x, nh, h, ny, y):
    plt.figure(i)
    ax3 = plt.subplot(3,1,3)
    plt.stem(ny, y, use_line_collection=True)
    plt.subplot(3,1,1, sharex=ax3)
    plt.stem(nx, x, use_line_collection=True)
    plt.subplot(3,1,2, sharex=ax3)
    plt.stem(nh, h, use_line_collection=True)
```

[4]:
```
n = np.arange(-5,21)
h1 = 1.0*(n >= 0)
h2 = np.zeros_like(n); h2[(n==0)]=1; h2[(n==1)]=-1
x1 = np.zeros_like(n) + (n >= 0)*(n < 6)
x2 = h1
```

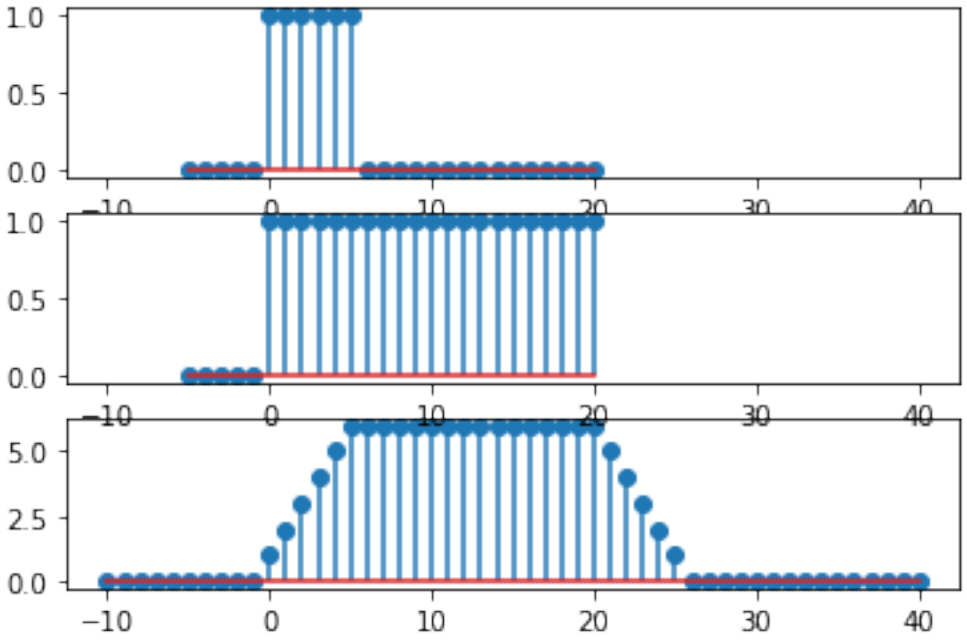
[5]:
```
# %matplotlib notebook
```

1.2 Compute convolutions

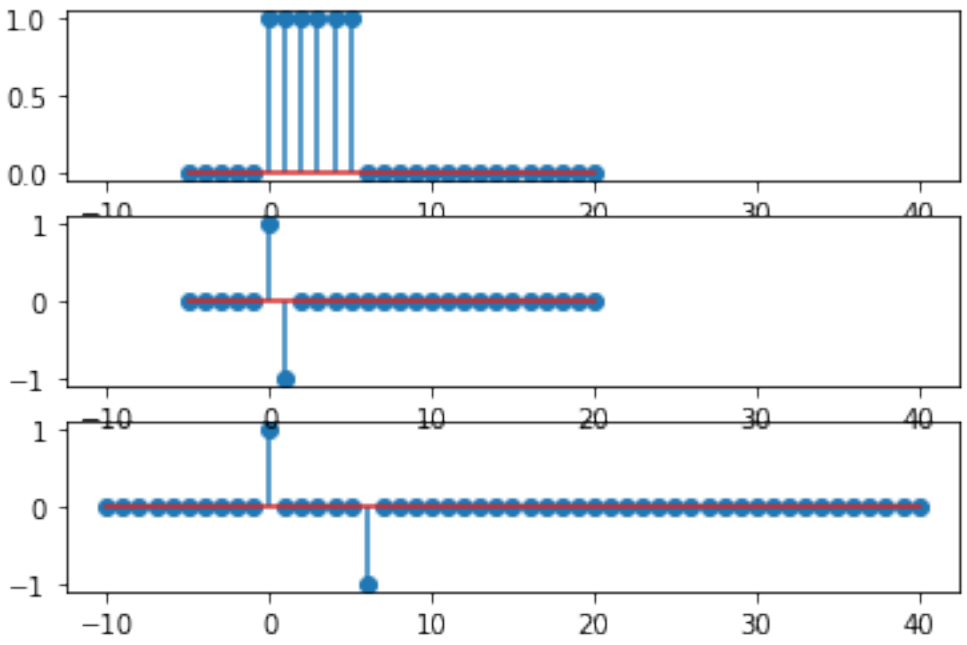
[6]:
```
ya = convolve(x1, h1)
yb = convolve(x1, h2)
yc = convolve(x2, h1)
yd = convolve(x2, h2)

plt.close('all')
ny = np.arange(2*min(n), 2*max(n)+1)
```

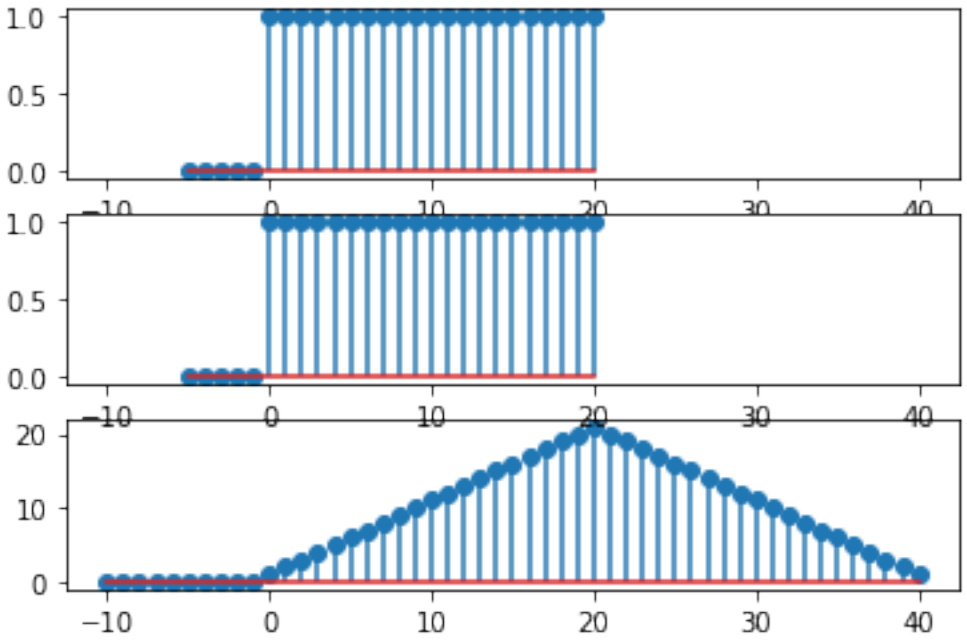
[7]:
```
plot3(1, n, x1, n, h1, ny, ya)
```



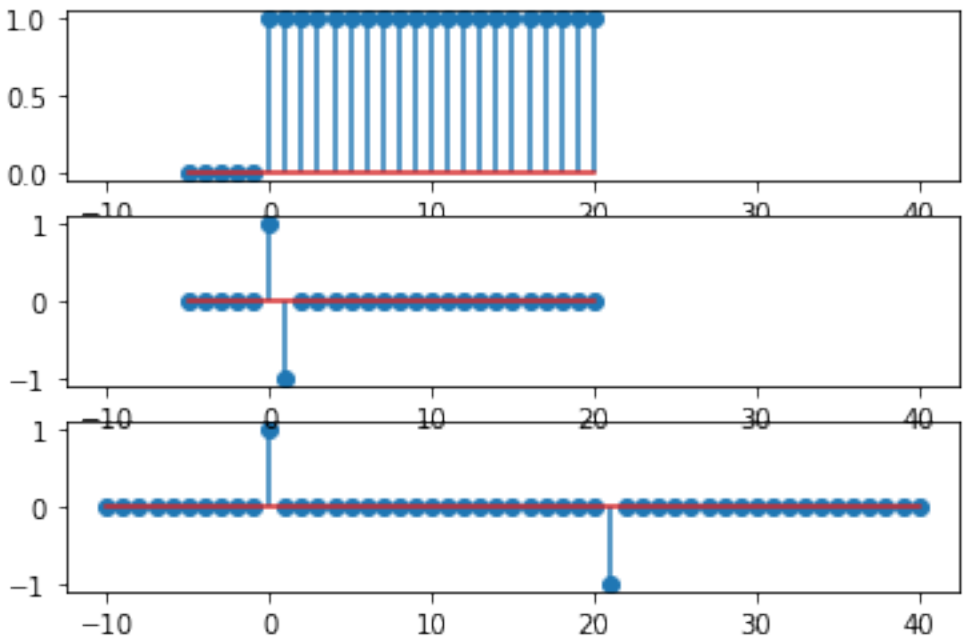
[8]:
```
plot3(1, n, x1, n, h2, ny, yb)
```



[9]:
```
plot3(1, n, x2, n, h1, ny, yc)
```

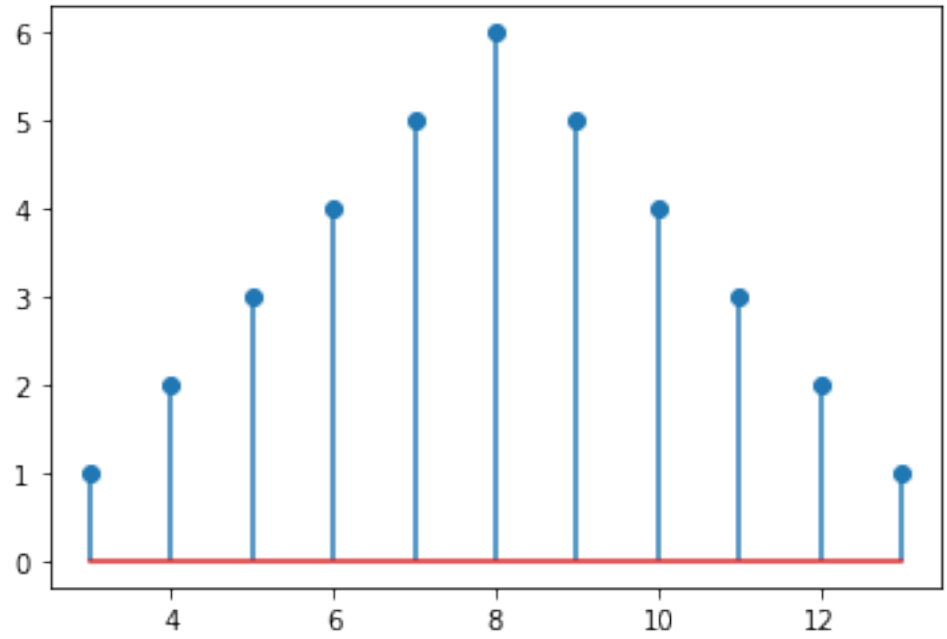


[10]:
```
plot3(1, n, x2, n, h2, ny, yd)
```



[11]:
```
p = np.ones(6)
z = convolve(p, p)
plt.close('all')
n = np.arange(0, 6)
nz = np.arange(3,14) #Modify this line
plt.stem(nz, z, use_line_collection=True)
```

[11]: <StemContainer object of 3 artists>



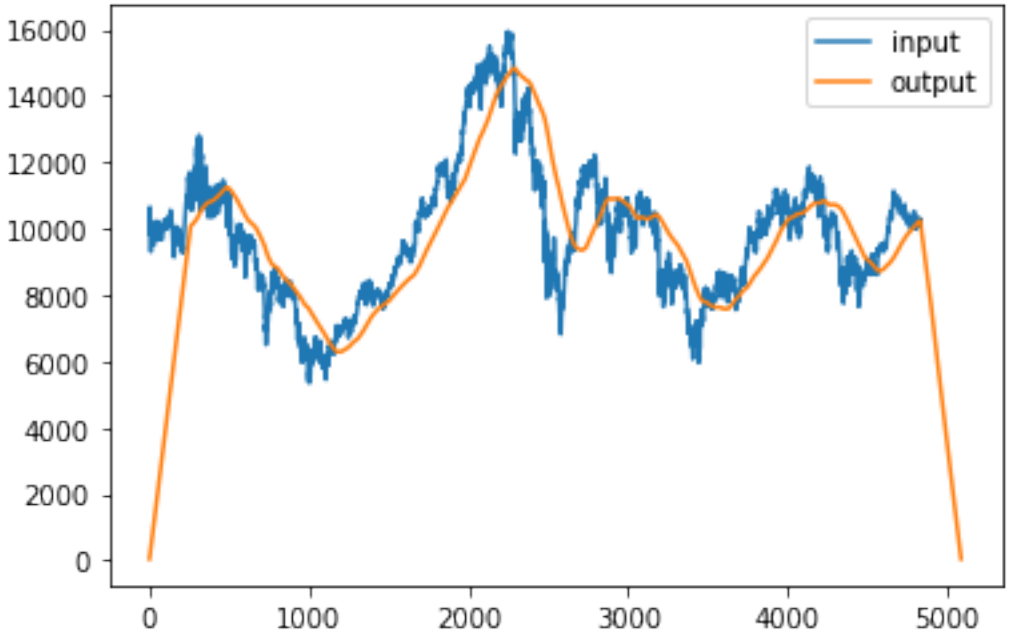
[12]:
```
z1 = convolve(x1,x2)
z2 = myconvolve(x2,x1)
print(z2 == z1)
```

```
[ True  True  True  True  True  True  True  True  True  True  True  True
  True  True  True  True  True  True  True  True  True  True  True  True
  True  True  True  True  True  True  True  True  True  True  True  True
  True  True  True  True  True  True  True  True  True  True  True  True
  True  True  True]
```

1.3 Removing short term variations from a signal

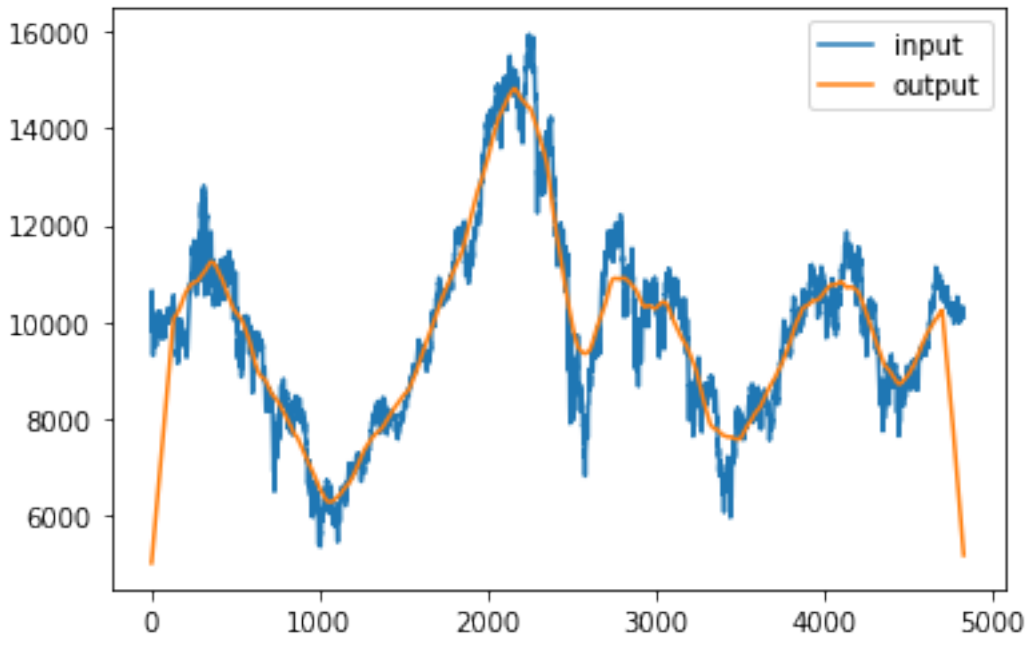
[13]:
```
df = pd.read_excel('Ibex35.xlsx', sheet_name='Hoja1')
x = df['Ibex 35'].values
f = df['fecha'].values
plt.close('all')
plt.plot(x, label='input')
M = 257
h0 = np.ones(M); h0/=M #Modify this line
y = convolve(x, h0)
# k = 1/2
# modifier = np.arange(0.0,len(y)); modifier*=k
# plt.plot(modifier, y, label='output')
plt.plot(y, label='output')
plt.legend(loc='best')
```

[13]: <matplotlib.legend.Legend at 0x14522b92c88>



[14]:
```
plt.close('all')
plt.plot(x, label='input')
y = convolve(x, h0, mode='same')
# k = 1/2
# modifier = np.arange(0.0,len(y)); modifier*=k
# plt.plot(modifier, y, label='output')
plt.plot(y, label='output')
plt.legend(loc='best')
```

[14]: <matplotlib.legend.Legend at 0x14523e0ba48>



[15]:
```
print(len(x)==len(y))
```

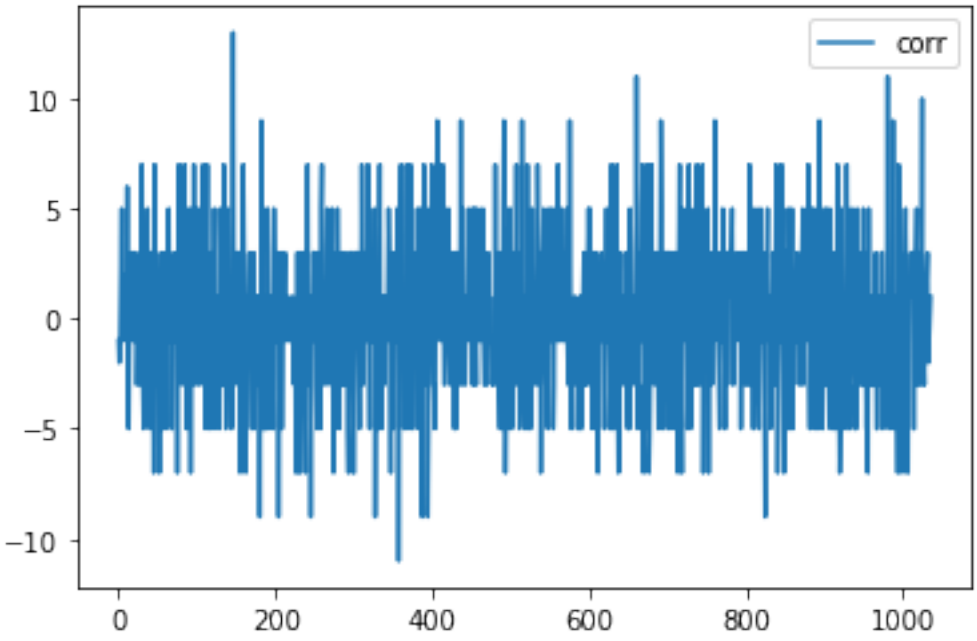
```
True
```

[16]:
```
p = np.array([ 1, -1, -1, 1, 1, 1, -1, 1, -1, -1, 1, 1, 1])
s = np.load('signals.npy')
id = 4 #select one of the signals
x = s[id]
#Find the pattern
```

[17]:
```
r_p = p[::-1]
y = convolve(x,r_p)
```

[18]:
```
plt.close('all')
plt.plot(y, label='corr')
plt.legend(loc='best')
```

[18]:
```
<matplotlib.legend.Legend at 0x14523d98b88>
```



[19]:
```
print(x[134:147]==p)
```

```
[ True  True  True  True  True  True  True  True  True  True  True  True
  True]
```