HW7 Report

309513073 黃威誠

■ HW7

– Conduct SRRC pulse shaping for a QPSK sequence (the Up-sampling factor is 64).

```
M = up-sampling factor;
n = [-128:127]-0.0001;
SRRC = (4*a/pi)* ( cos((1+a)*pi*n./M ) + (M*sin((1-a)*pi*n./M)  ./
(4*a*n) )  ) ./ (1-(4*a*n./M).^2);
up-sampling factor = 64;
```

和課堂上一樣去設置SRRC

/////

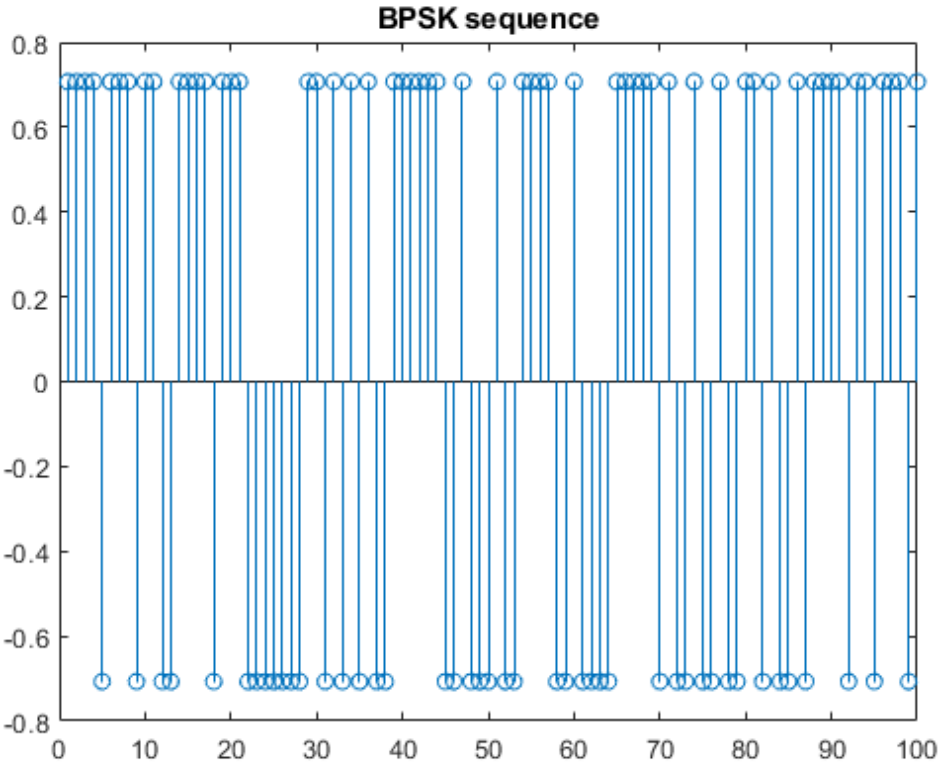
```
QPSK = randi([0 1],2,Ns); % random signal 2*Ns
QPSK(QPSK==0) = -1;
QPSK_sequence = (1/sqrt(2)) *(QPSK(1,:) + 1j*QPSK(2,:));
```

並產出QPSK的sequence

– Use the practical DAC.

```
DMA = ones(1,64);
fd = conv(DMA,du);
```

:practical的部分在於up-sampling完去做一個rectangular的filter
將impulse變成如同hold住一段時間的方波



上圖為 BPSK 的 sequence，這邊先用 BPSK 描述 practical 的情況是因為 QPSK 有複數的部分，所以畫出來會很難理解。

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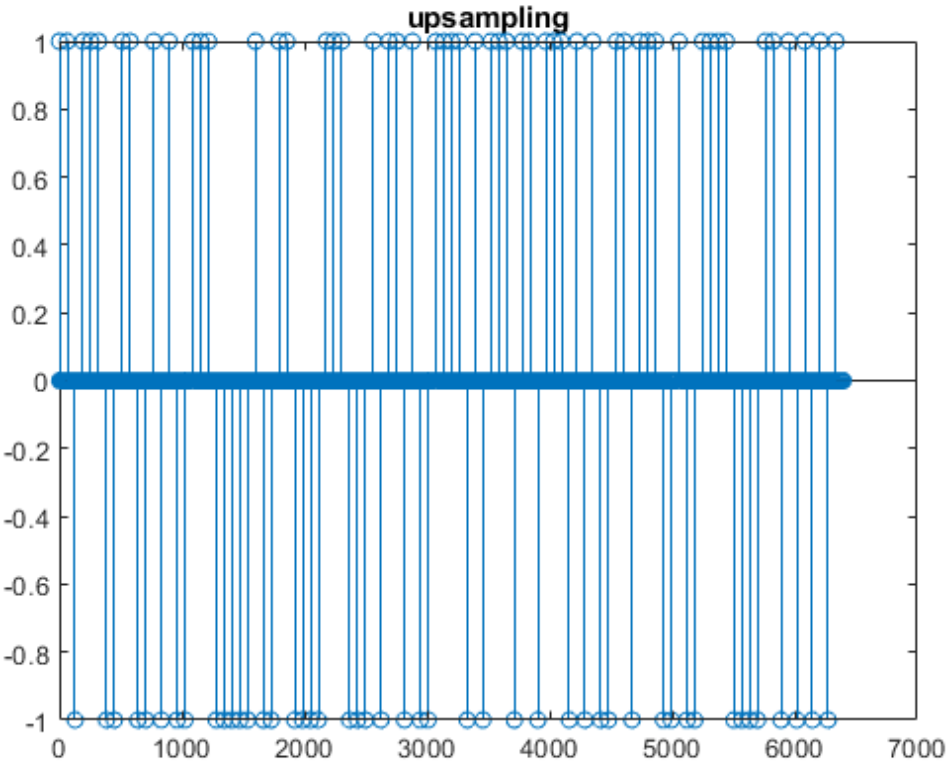
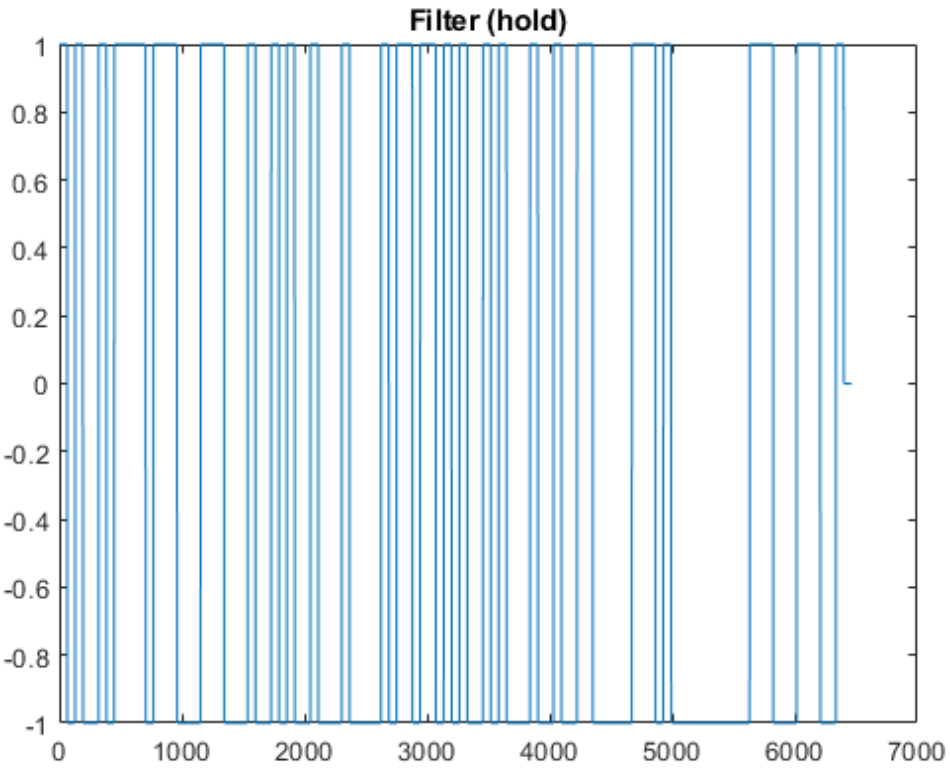

upsampling
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1000
2000
3000
4000
5000
6000
7000

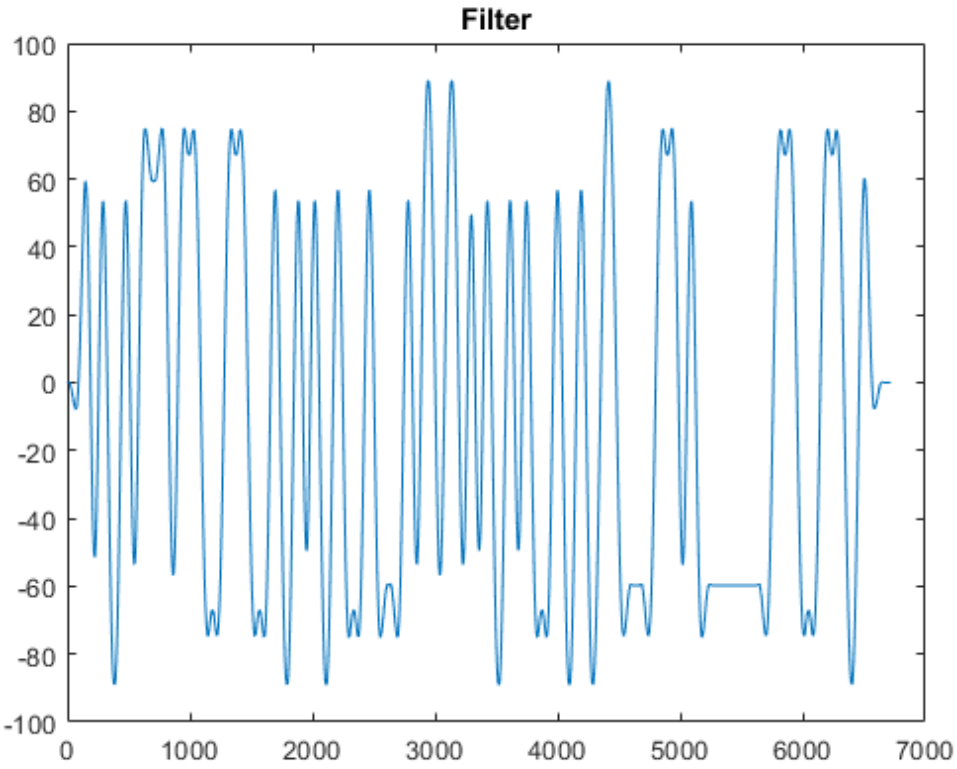
↓


Filter (hold)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1000
2000
3000
4000
5000
6000
7000

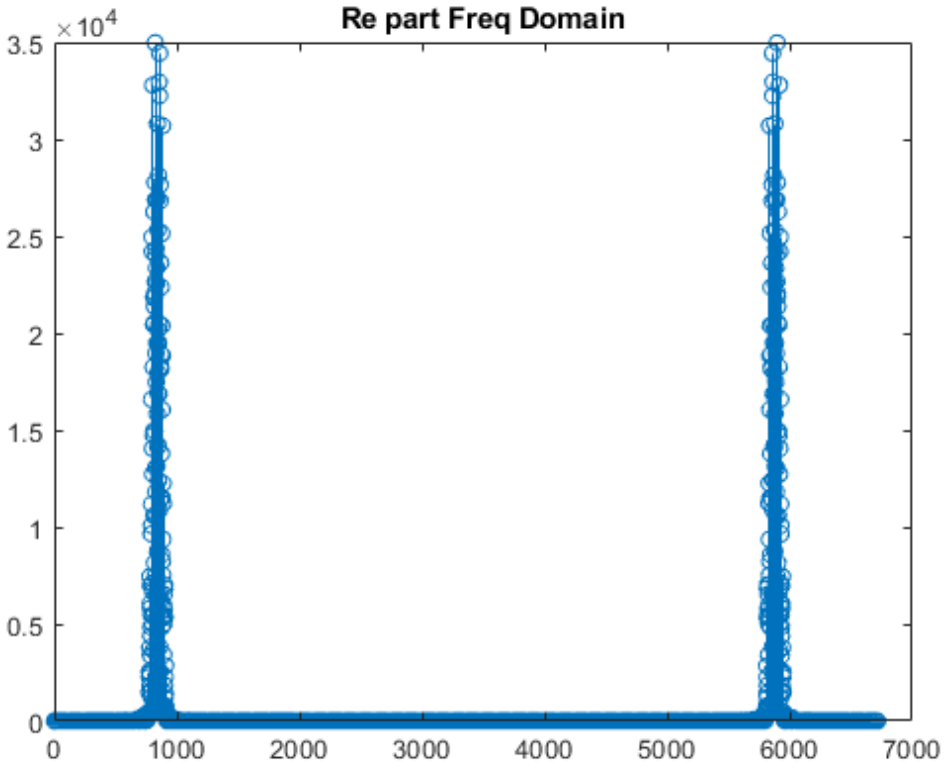
達到 hold 住的效果

- **Let the symbol rate be 1MHz, the carrier frequency be 8MHz. Conduct the up-conversion operation in the equivalent digital domain.**

接下來去做剩餘的部分，也就是通過 SRRC，再乘上 exponential 後取實數部分。



-Observe the up-converted spectrum to see if your design is correct.



最後結果的頻譜就是將 QPSK 的訊號用載波調變上去

1M(symbol rate)*64(up-sampling factor)*(carrier frequency) =8M(analogy carrier frequency)

(carrier frequency) = 1/8

847/6718 ~= 0.125，符合 1/8 cosine 波的頻譜

Conclusion

這次做up-conversion的模擬，從bit sequence開始一直到升頻的部分一步步都有細節的執行，對於實際了解通訊系統的block diagram非常有幫助。