

```
% First-order, single-bit Delta-Sigma Modulator  
% Code is incomplete.
```

```
clear all;  
close all;
```

```
N = 2^12;  
%X = 0.8;  
samp = 1:N;  
cycles = 50;  
X = 0.5*sin(cycles*2*pi*samp./(N));  
I = zeros(N,1);  
Y = ones(N,1);
```

```
% Delta-Sigma Block
```

```
for i = 1:N-1  
    if i > 1  
        I(i) = I(i-1) + X(i) - Y(i);  
    else  
        I(i) = X(i) - Y(i);  
    end  
    if (I(i) < 0)  
        Y(i+1) = -1;  
    else  
        Y(i+1) = 1;  
    end  
end
```

```
% Calculate Running Average (W) of output
```

```
% Enter Code here:
```

```
W = zeros(N,1);  
for i = 1:N-1  
    W(i) = mean(Y(1:i));  
end
```

```
% Plot Output
```

```
figure(1);  
stairs(Y, 'b-');  
hold on;  
stairs(W, 'r-');  
stairs(X, 'm-');  
%stairs(I, 'm-');  
legend('Digital Output (Y)', 'Running Average (W)', 'Input (X)');  
axis([0 N -1.2 1.2]);  
xlabel('Sample Number')  
grid on;  
title('HW2 P2a');
```

```
s = abs(fft(Y));  
s = s/(N/2);  
s = s(1:N/2);  
s_dbfs = 20*log10(s);
```

```
figure(2);  
f = (1:N/2) ./ (N/2);  
semilogx(f, s_dbfs, '-')  
title('HW2 P2c');
```

```
ylabel('dBFS');  
xlabel('Normalized Frequency')  
  
%total_power = sum(s(1:N/(2*20)));
```