

Information:

Names :

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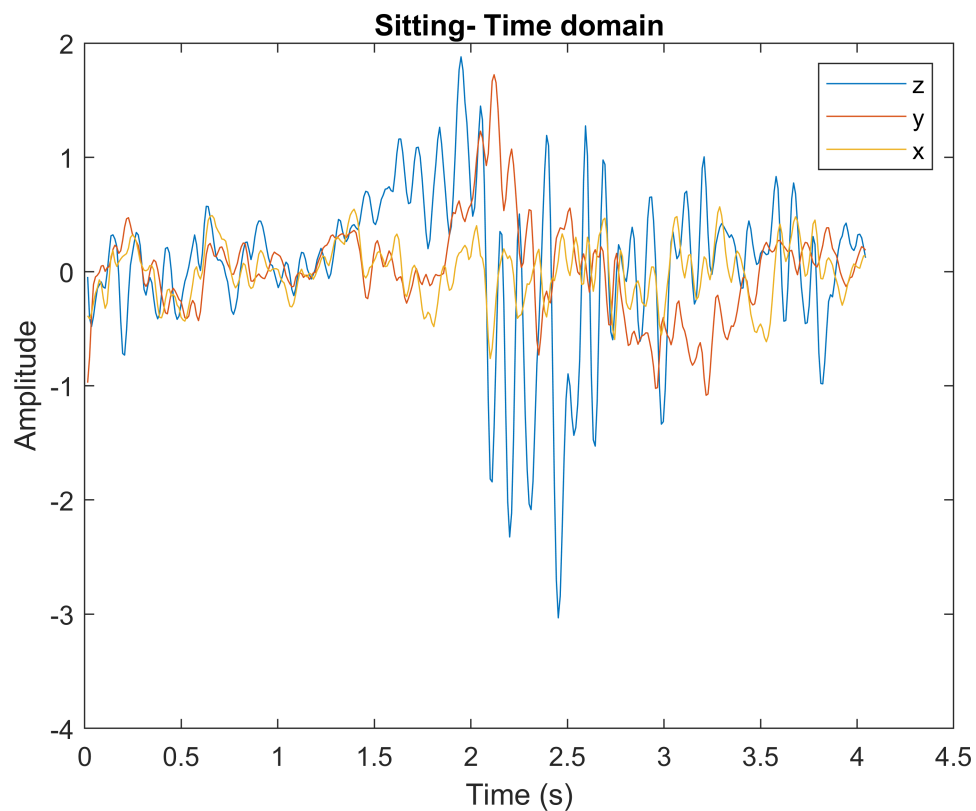
Amna Alyafei 201905209

Ayesha Balideh 201803019

Section: B54

Phone Model: iPhone 13

```
%read data of Sitting
s= csvread('sitting.csv',1,1);
t1 = s(:,1);
z1 = s(:,2);
y1 = s(:,3);
x1 = s(:,4);
Y1 = [z1 y1 x1];
figure, plot(t1, Y1);
title('Sitting- Time domain');
xlabel('Time (s)');
ylabel('Amplitude');
legend('z','y','x');
```



```

%fft sitting
N1 = length(Y1);
T1 = max(t1);
SF = fftshift(fft(Y1,N1));
Fs = N1/T1;
%magnitude
S_mag = abs(SF/N1)

```

```

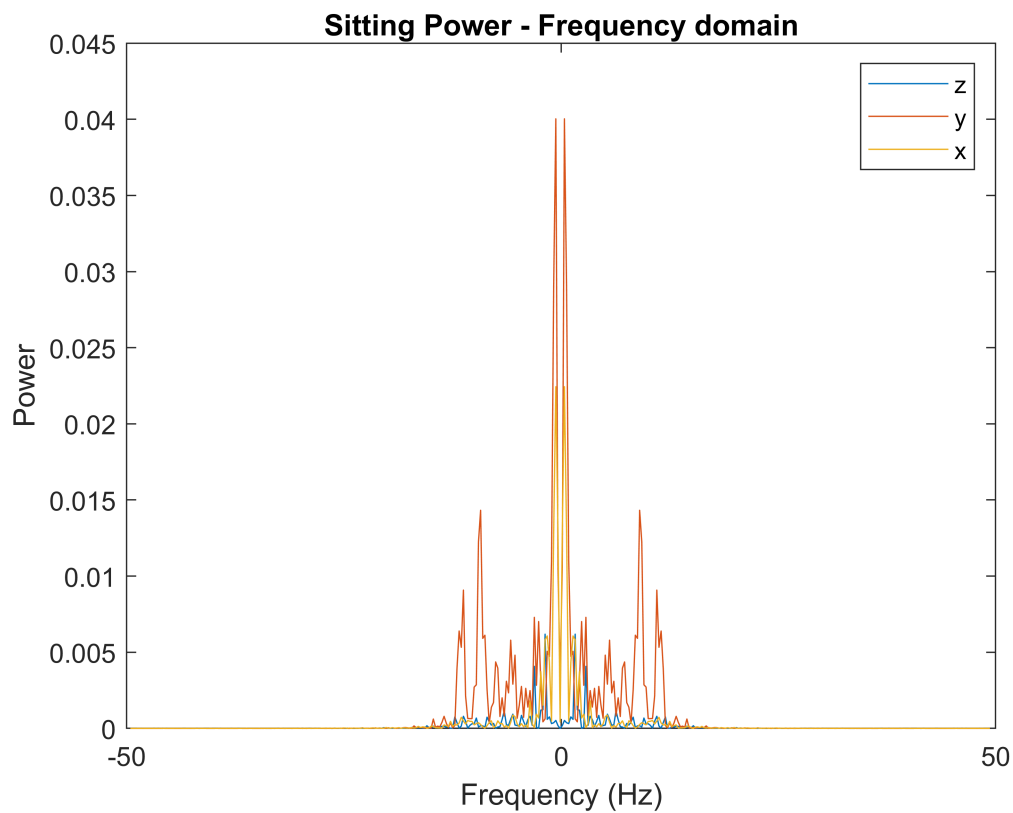
S_mag = 401x3
    0.0006    0.0001    0.0014
    0.0004    0.0002    0.0013
    0.0005    0.0001    0.0015
    0.0007    0.0005    0.0015
    0.0009    0.0000    0.0017
    0.0005    0.0003    0.0014
    0.0013    0.0006    0.0018
    0.0005    0.0003    0.0016
    0.0010    0.0002    0.0017
    0.0007    0.0005    0.0017
    ⋮

```

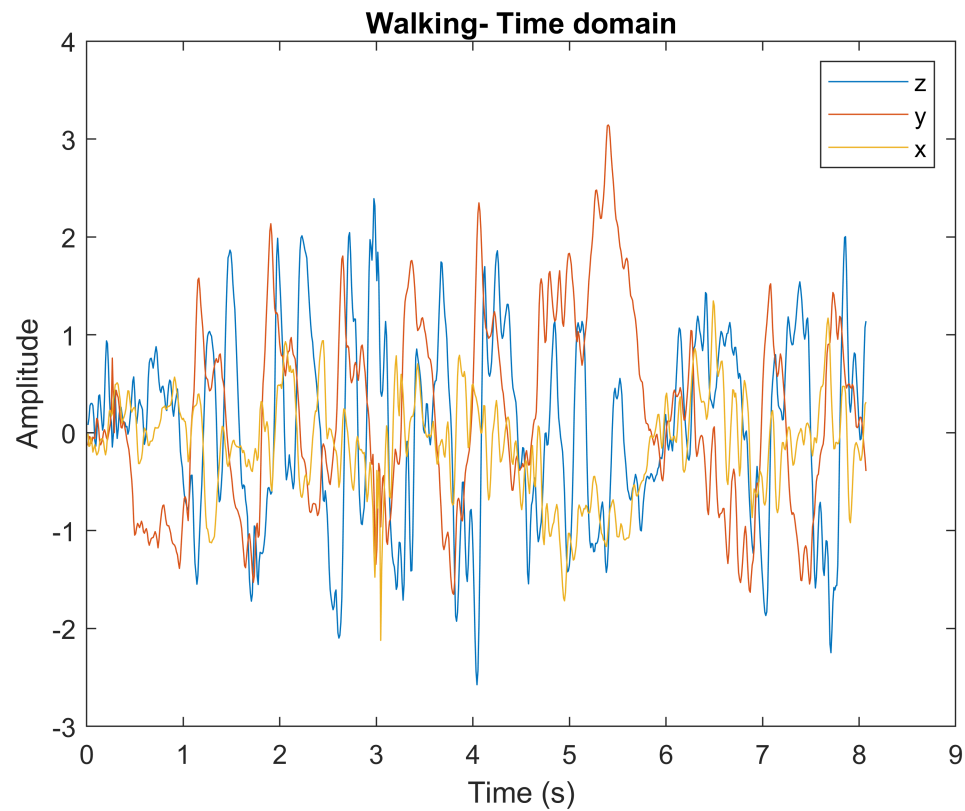
```

%phase
S_phase = angle(SF);
%power
S_power = S_mag.^2;
%frequency axis
df = Fs/N1;
s1 = -Fs/2 : df : Fs/2-df;
%plot
figure, plot(s1,S_power);
title('Sitting Power - Frequency domain');
xlabel('Frequency (Hz)');
ylabel('Power');
legend('z','y','x');

```



```
%read data of Walking
w= csvread('walking.csv',1,1);
t2 = w(:,1);
z2 = w(:,2);
y2 = w(:,3);
x2 = w(:,4);
Y2 = [z2 y2 x2];
figure, plot(t2, Y2);
title('Walking- Time domain');
xlabel('Time (s)');
ylabel('Amplitude');
legend('z', 'y', 'x');
```

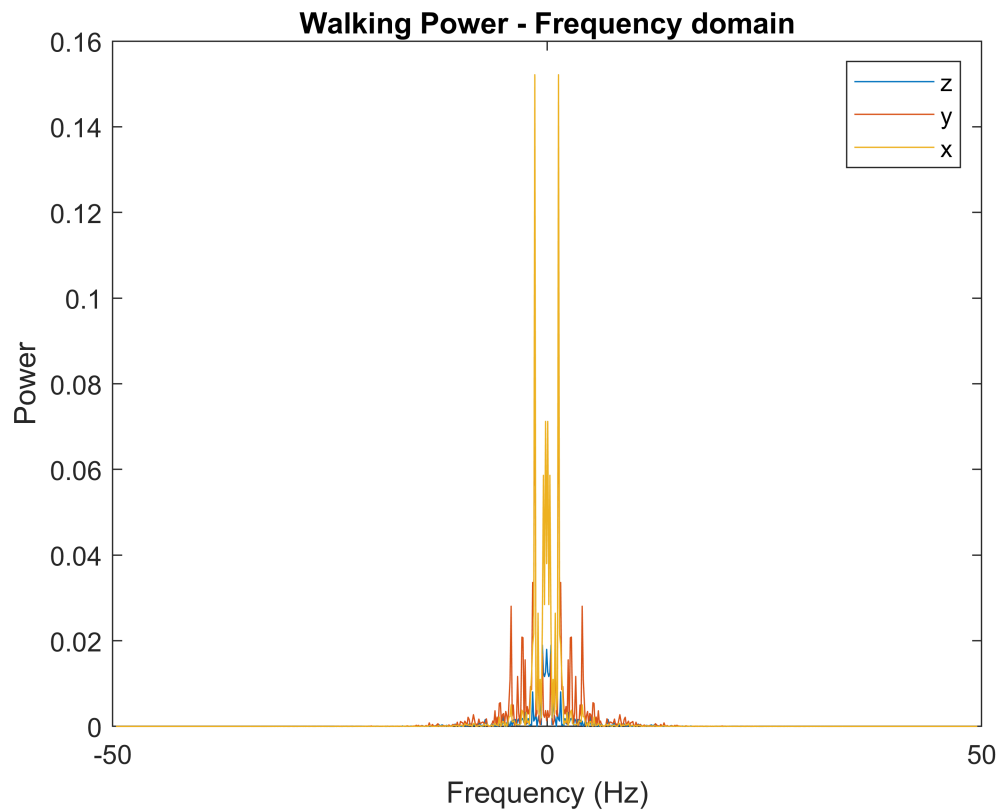


```
%fft walking
N2 = length(Y2);
T2 = max(t2);
WF = fftshift(fft(Y2,N2));
Fs2 =N2/T2;
%magnitude
W_mag = abs(WF/N2)
```

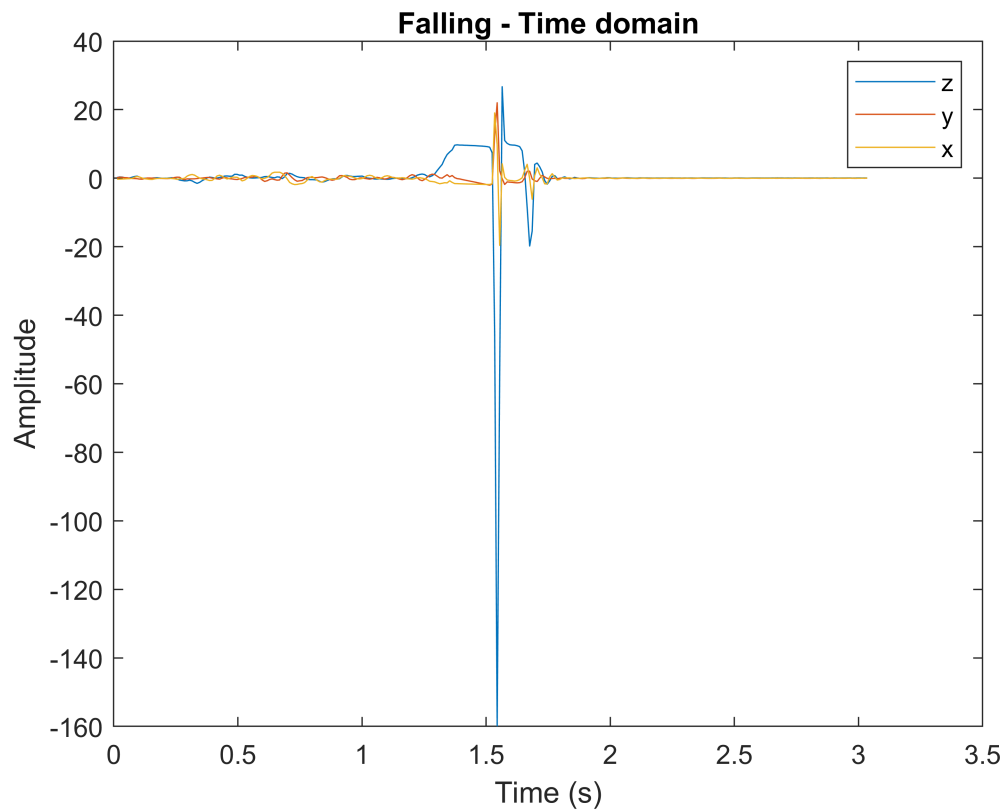
```
W_mag = 801x3
    0.0003    0.0005    0.0001
    0.0003    0.0001    0.0000
    0.0001    0.0002    0.0003
    0.0006    0.0010    0.0003
    0.0001    0.0009    0.0005
    0.0003    0.0002    0.0004
    0.0004    0.0008    0.0002
    0.0003    0.0009    0.0007
    0.0009    0.0010    0.0002
    0.0006    0.0005    0.0006
    ⋮
```

```
%phase
W_phase = angle(WF);
%power
W_power = W_mag.^2;
%frequency axis
df2 = Fs2/N2;
w = -Fs2/2 : df2 : Fs2/2-df2;
```

```
%plot
figure, plot(w,W_power);
title('Walking Power - Frequency domain');
xlabel('Frequency (Hz)');
ylabel('Power');
legend('z','y','x');
```



```
%read data of Falling
f= csvread('falling.csv',1,1);
t3 = f(:,1);
z3 = f(:,2);
y3 = f(:,3);
x3 = f(:,4);
Y3 = [z3 y3 x3];
figure, plot(t3, Y3);
title('Falling - Time domain');
xlabel('Time (s)');
ylabel('Amplitude');
legend('z','y','x');
```



```
%fft - falling
N3 = length(Y3);
T3 = max(t3);
FF = fftshift(fft(Y3,N3));
Fs3 =N3/T3;
%magnitude
F_mag = abs(FF/N3)
```

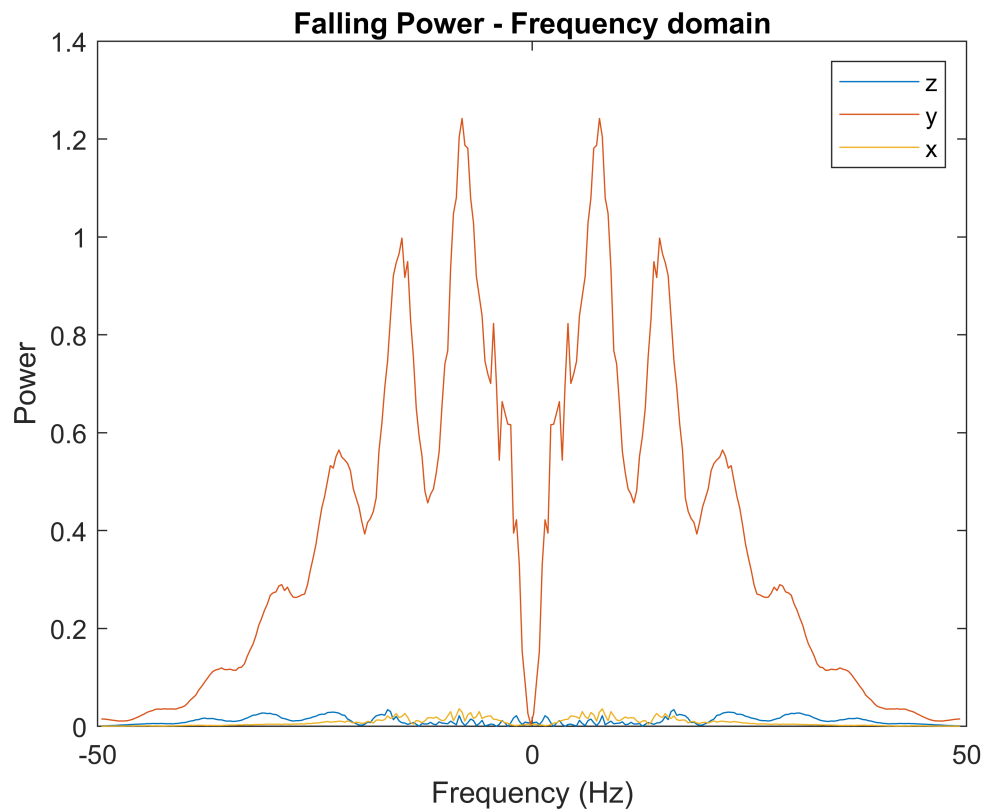
```
F_mag = 301x3
    0.0354    0.1236    0.0266
    0.0360    0.1223    0.0256
    0.0378    0.1199    0.0254
    0.0405    0.1161    0.0268
    0.0427    0.1122    0.0256
    0.0453    0.1093    0.0253
    0.0502    0.1050    0.0264
    0.0532    0.1051    0.0257
    0.0550    0.1055    0.0253
    0.0572    0.1077    0.0286
    ⋮
```

```
%phase
F_phase = angle(FF);
%power
F_power = F_mag.^2;
%frequency axis
df3 = Fs3/N3;
```

```

f = -Fs3/2 : df3 : Fs3/2-df3;
%plot
figure, plot(f,F_power);
title('Falling Power - Frequency domain');
xlabel('Frequency (Hz)');
ylabel('Power');
legend('z','y','x');

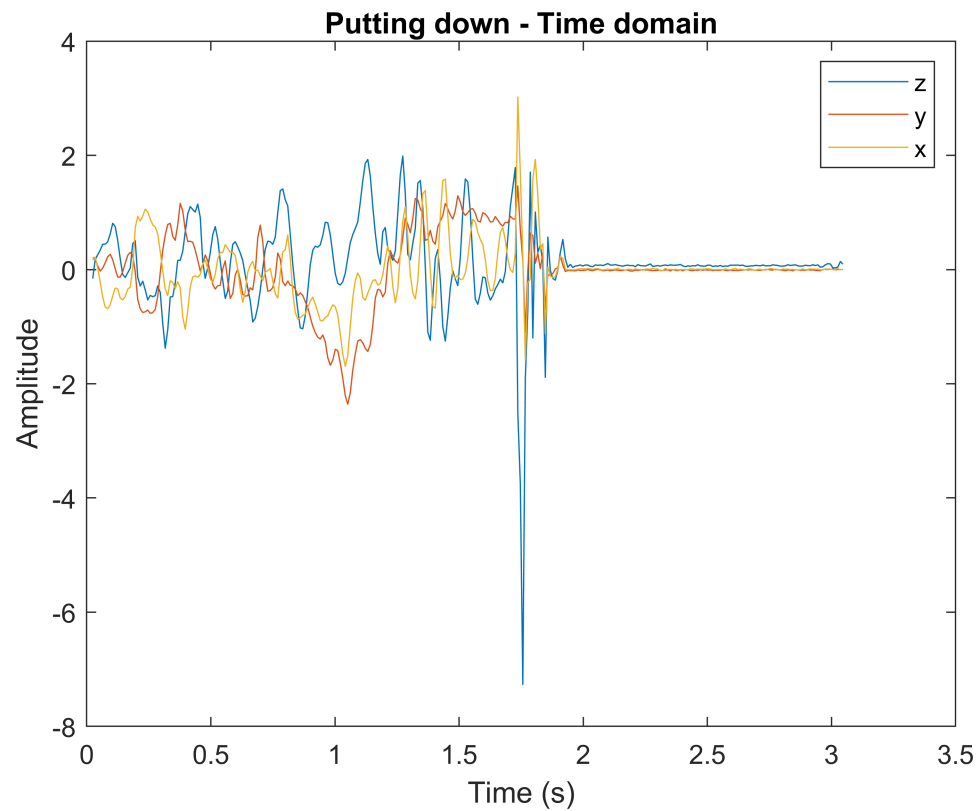
```



```

%read data of Putting Down
p= csvread('putting_down.csv',1,1);
t4 = p(:,1);
z4 = p(:,2);
y4 = p(:,3);
x4 = p(:,4);
Y4 = [z4 y4 x4];
figure, plot(t4, Y4);
title('Putting down - Time domain');
xlabel('Time (s)');
ylabel('Amplitude');
legend('z','y','x');

```



```
%fft - putting down
N4 = length(Y4);
T4 = max(t4);
PF = fftshift(fft(Y4,N4));
Fs4 =N4/T4;
%magnitude
P_mag = abs(PF/N4)
```

```
P_mag = 301x3
    0.0170    0.0232    0.0082
    0.0165    0.0247    0.0083
    0.0164    0.0249    0.0076
    0.0166    0.0267    0.0078
    0.0141    0.0264    0.0067
    0.0143    0.0270    0.0068
    0.0141    0.0266    0.0074
    0.0128    0.0282    0.0064
    0.0116    0.0304    0.0069
    0.0107    0.0290    0.0058
    ⋮
```

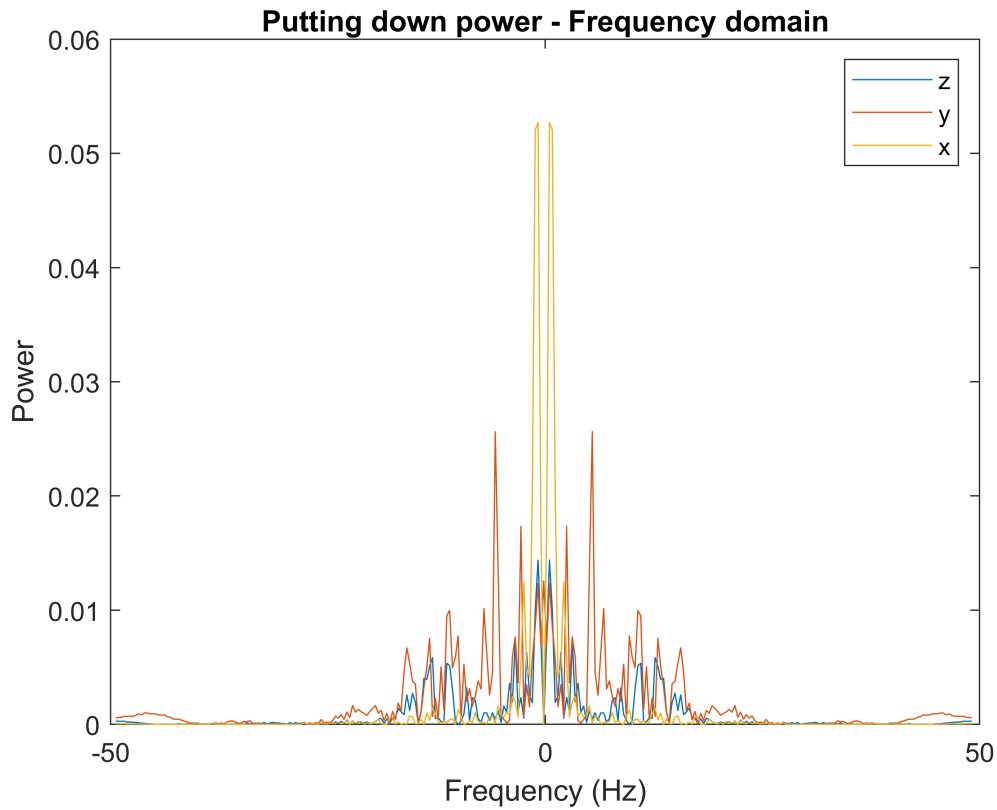
```
%phase
P_phase = angle(PF);
%power
P_power = P_mag.^2;
%frequency axis
df4 = Fs4/N4;
```



```

p = -Fs4/2 : df4 : Fs4/2-df4;
%plot
figure, plot(p,P_power);
title('Putting down power - Frequency domain');
xlabel('Frequency (Hz)');
ylabel('Power');
legend('z','y','x');

```



```

%for loop
threshold= 0.2;
fall = 0;
%sitting
ymax = max(S_power(:,2)); %extracting the maximum (y-axis Power for Sitting)
for f = 1:N1
    if ymax > threshold
        fall = 1;
    else
        fall = 0;
    end
end

if fall == 1
    display("Falling");
else
    display("Not falling");
end

```

"Not falling"

```
%for loop
%walking
ymax = max(W_power(:,2)); %extracting the maximum (y-axis Power for Walking)
for f = 1:N2
    if ymax > threshold
        fall = 1;
    else
        fall = 0;
    end
end

if fall == 1
    display("Falling");
else
    display("Not falling");
end
```

"Not falling"

```
%for loop
%falling
ymax = max(F_power(:,2)); %extracting the maximum (y-axis Power for Falling)
for f = 1:N3
    if ymax > threshold
        fall = 1;
    else
        fall = 0;
    end
end

if fall == 1
    display("Falling");
else
    display("Not falling");
end
```

"Falling"

```
%for loop
%putting down
ymax = max(P_power(:,2)); %extracting the maximum (y-axis Power for putting down)
for f = 1:N4
    if ymax > threshold
        fall = 1;
    else
        fall = 0;
    end
end

if fall == 1
```

```
    display("Falling");  
else  
    display("Not falling");  
end
```

```
"Not falling"
```

Threshold

We displayed the power spectrum of each position, we noticed that the y values were the variables that changed the most when falling. We extracted the y values for all positions, then taking the maximum to choose a suitable threshold value. We recognised that the maximum values for positions other than falling, was less than 0.2.

Power spectrum

We chose the power spectrum instead of the other spectrums because while having different positions the power which depends on the magnitude was clearly displayed.