Isometric Muscle Contractions

Experiment 1.1:

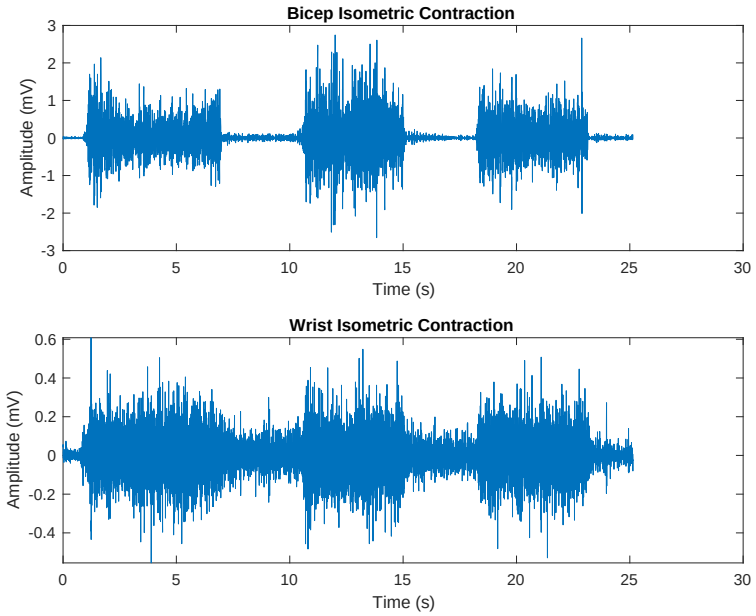

Figure 1: The graph of Bicep and wrist concentration with removed initial noisy part

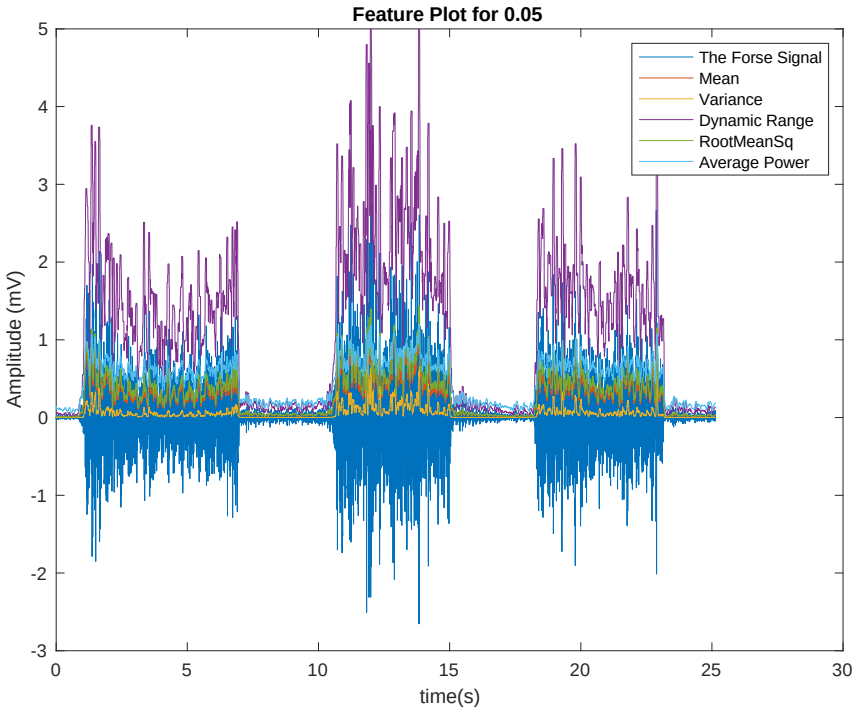

Figure 2: 0.05s windowing for all features overlapping the main signal

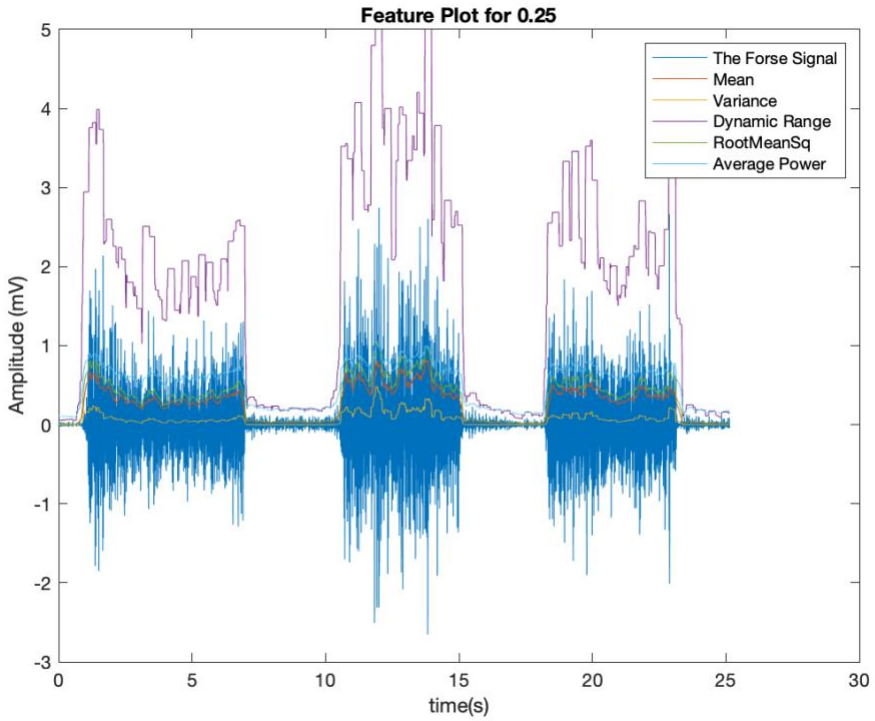

Figure 3: 0.25s windowing for all features overlapping the main signal

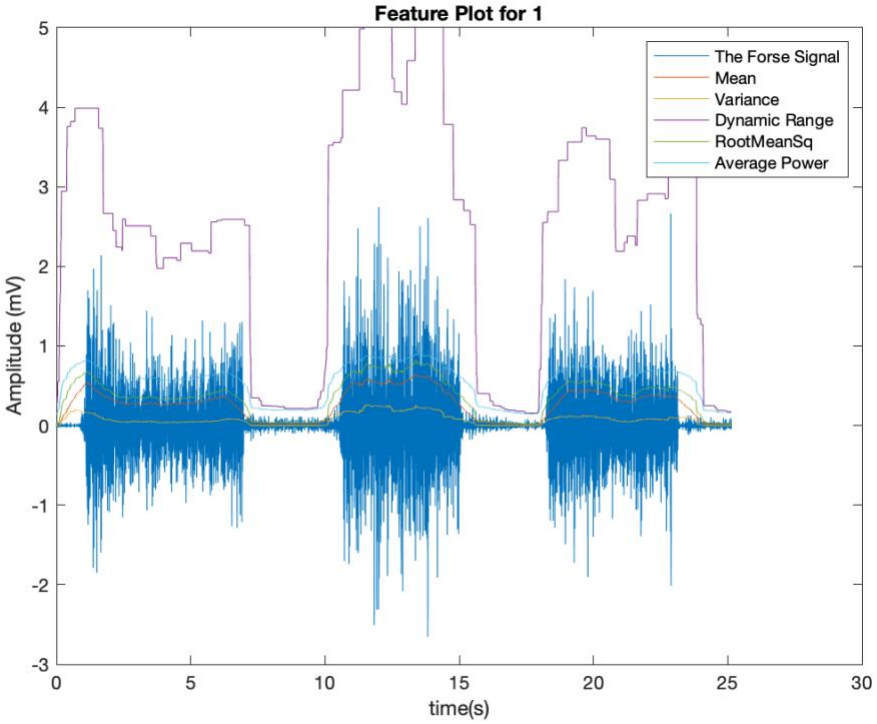

Figure 4: 1s windowing for all features overlapping the main signal

Grasp Force Measurement

Experiment 2:

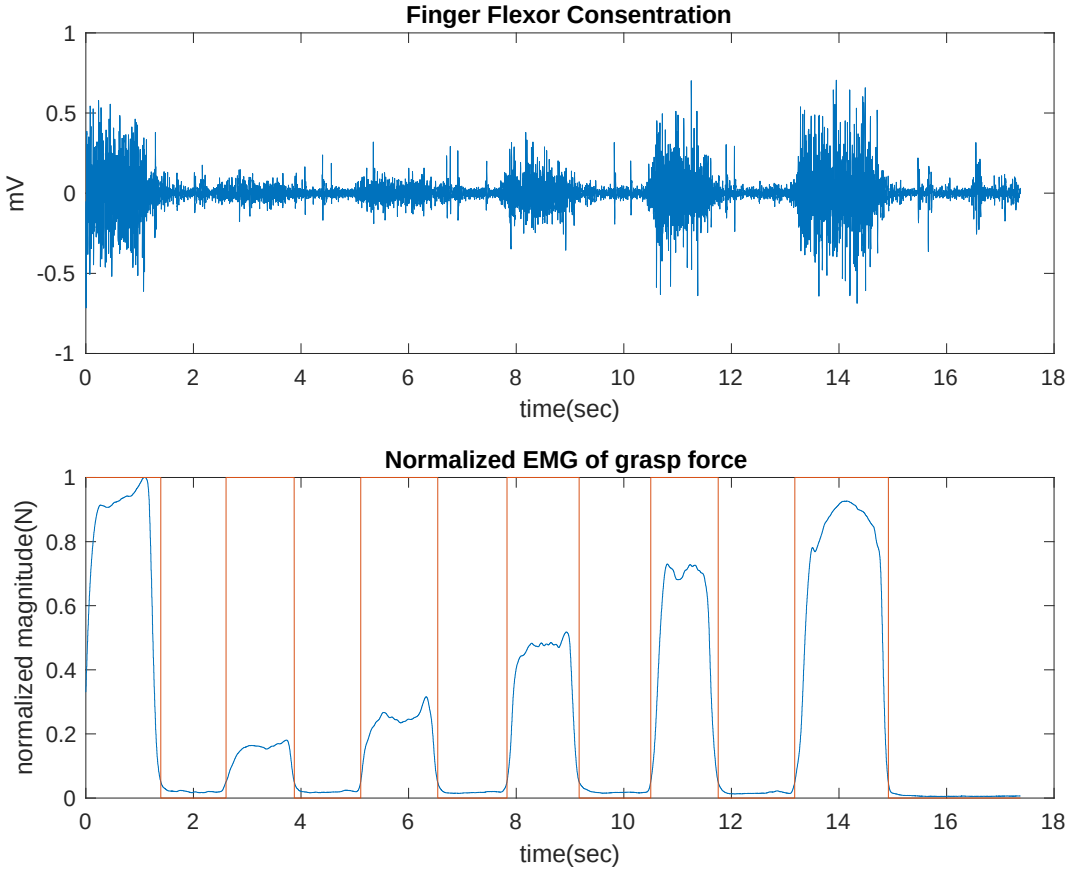

Figure 5: the EMG and normalized force signals as subplots

Segment	1	2	3	4	5	6
Force	0.8113	0.1536	0.2377	0.4321	0.6008	0.7681
Mean	0.4743	0.4741	0.4742	0.4742	0.4739	0.4742
Variance	0.0167	6.8183e-04	0.0010	0.0039	0.0109	0.0158
DR	[1 1408]	[1 1100]	[1 1344]	[1 1248]	[1 1164]	[1 1656]
MS	3.3687e-04	4.3099e-04	3.5283e-04	3.8000e-04	4.0716e-04	2.8634e-04
RMS	0.4916	0.4748	0.4753	0.4784	0.4853	0.4905

Table 1: the five different metrices values

Explanation: during writing MATLAB code for part b,c,e of experiment 2 and experiment 3 there was complications and the code did not run as it should be. Therefore, the report is not complete and some parts of it missing. However, the code for the parts that did not run is submitted with the lab report.

Post Lab Questions

A. Each of the short analyses offers specific data knowledge. The dynamic spectrum, average square and average power calculations were performed. In order to calculate the data set with the minimum and highest values, a dynamic range was used. Another metric was the mean root square used to calculate the data magnitude and the average power magnitude.

B. This encourages the data to be divided into smaller bits as short-term analyses are carried out so that they can be read more easily in sections. The limited windows analysis helps one to see, instead of evaluating the whole picture, what's happening inside the particular window. When contemplating actual applications such as EMG data, the data collection collected with short windows is more reliable.

C. Exercise 2 reveals that the average correlates better or most closely with the behaviour of EMG. By looking at the correlation coefficient and MSE table, it can be shown that the mean has a small MSE that is close to 0, and a high amount close to 1 for correlation coefficient. This means that the average is nearest to the operation of the EMG.

D. The window size is a number of samples and a length. The window size determines the analytical time or frequency resolution. The input window offers a clearer interpretation of dataset functionality and makes it easy to spot patterns as data are more clearly represented. On the basis of part 1 the optimum 0.25s window size is more ideal in the experiment. The window displays all the data tightly clustered together, making it harder to read if the range is narrower as 0.05. In the other hand, the data would be too separate if the window size were 1 or 1.5 and the drastic variations and variations within these statistics would be impossible to recognise.

E. The study of regression is used to assess whether a linear relationship occurs between a dependent variable and one or more different variables. The regression analysis is referred to in this particular laboratory as the relation between the behaviour of EMG and muscle strength. In relation to EMG operations, the five characteristics were considered. Data precision determines the pitch of the linear regression line. In practise 2, the mean and the RMS were connected to the applicable force since the graph's slope was closer to 1. The highest value and minimum value are found and subtracted from a dynamic spectrum.