Mussle Power !
(a.k.a Mussel Paua)
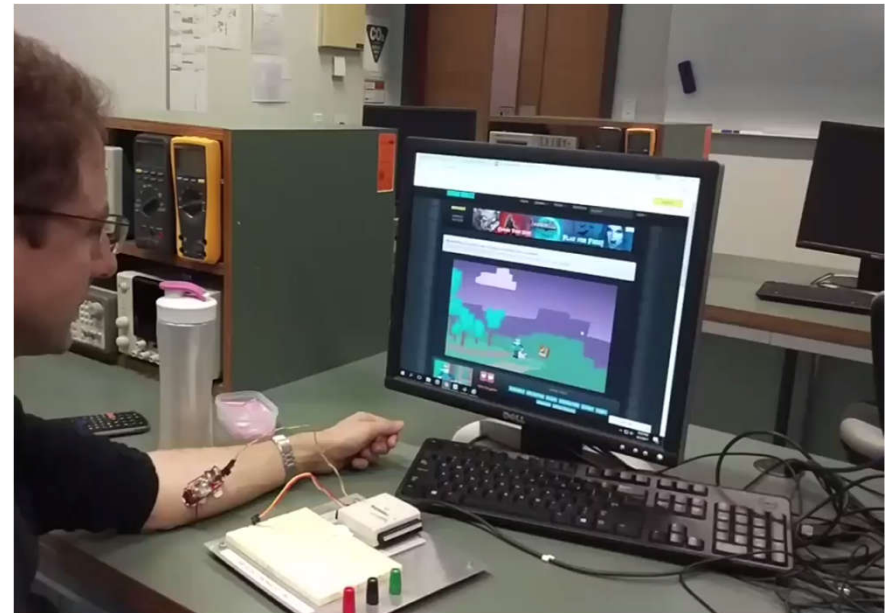
Yile Ying @ VUW

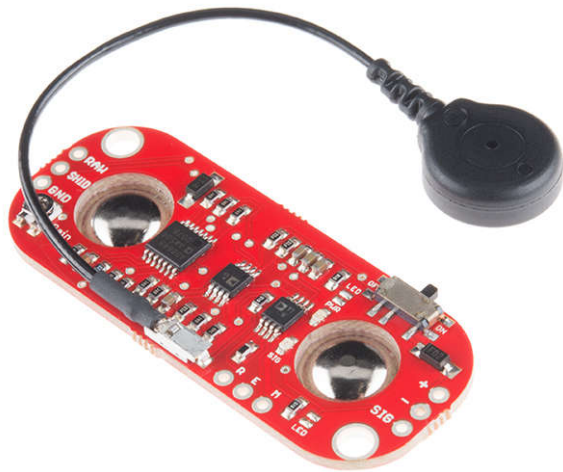08/06/2017

yile.ying@gmail.com

Have you ever ... ?

Souce: Google Image search.

A computer program allows you to…

- **Control your computer using muscles**
  - Play video games! Yeah!
  - Do whatever you want.
- **Monitor muscle activities**
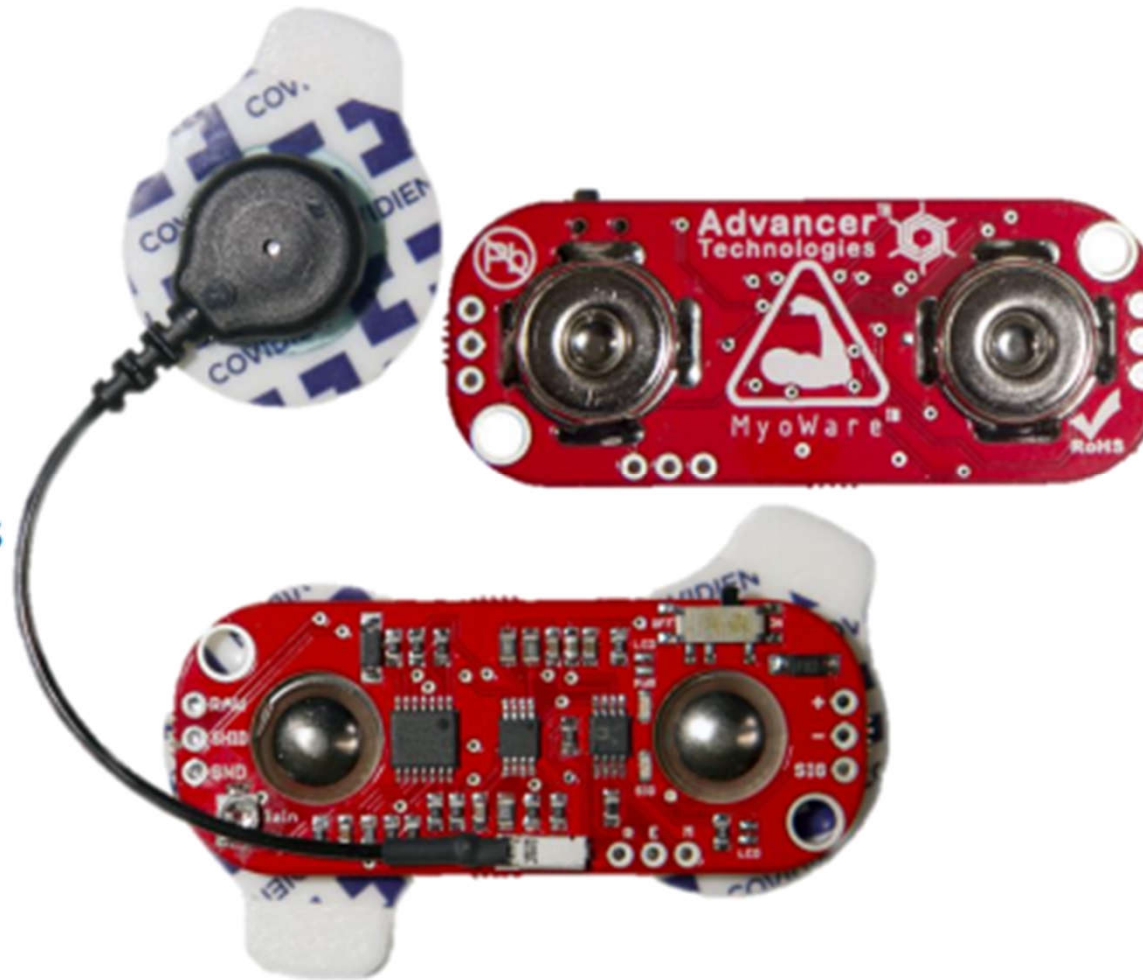 - How many times?
 - How long?
  - How strong?

Three devices

MyoWare Muscle Sensor -> sEMG Signal

Source: Advancer Technologies. (2015). *MyoWare™ Muscle Sensor (AT-04-001) Datasheet.* Retrieved June 2017 from: https://cdn.sparkfun.com/assets/learn_tutorials/4/9/1/MyoWareDatasheet.pdf **5**
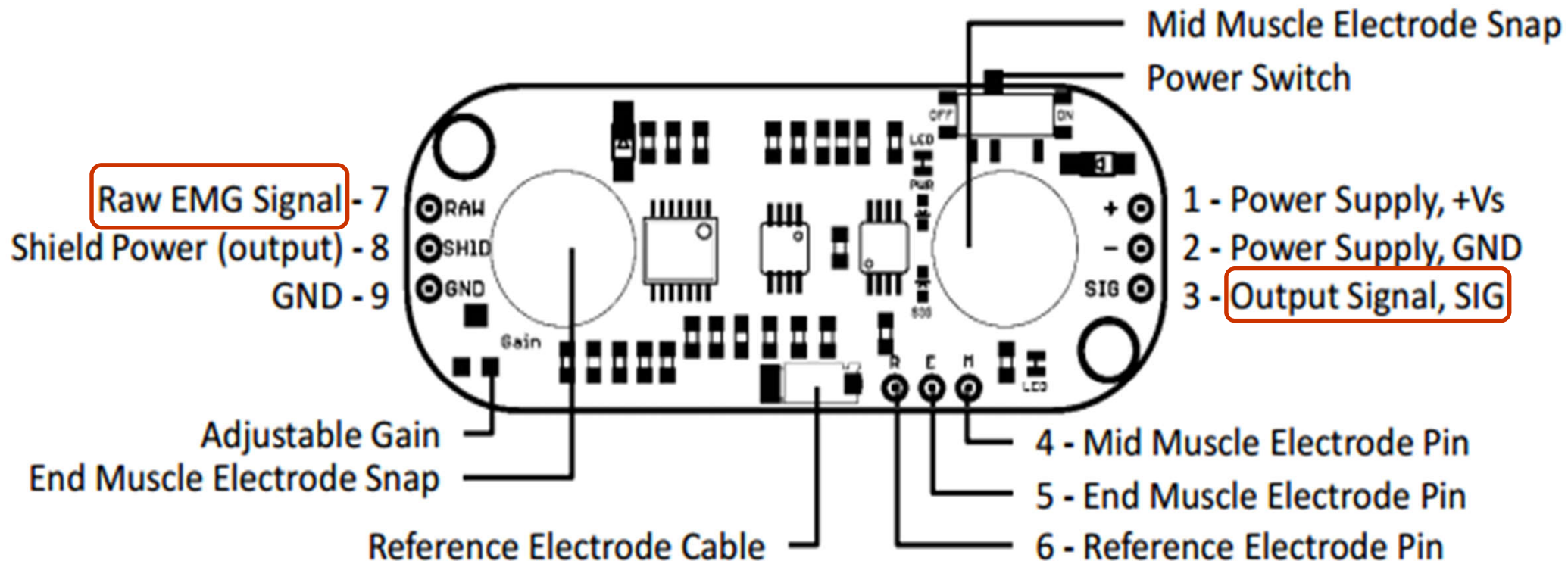
sEMG Signal is the Superposition of Motor Unit Signals Range from 20Hz~150Hz

MU 1 (3 Hz)

+

MU 2 (4 Hz)

+

MU 3 (6 Hz)

+

M4 (8 Hz)
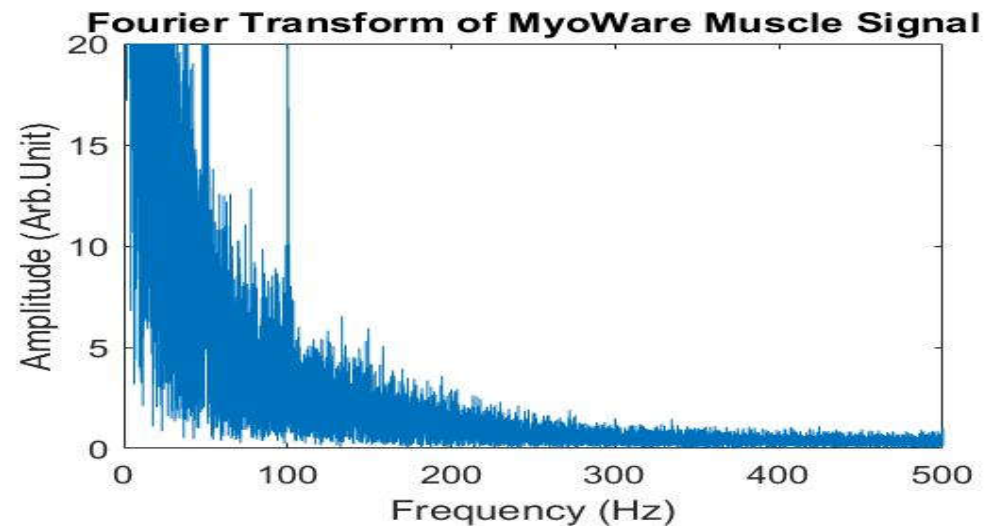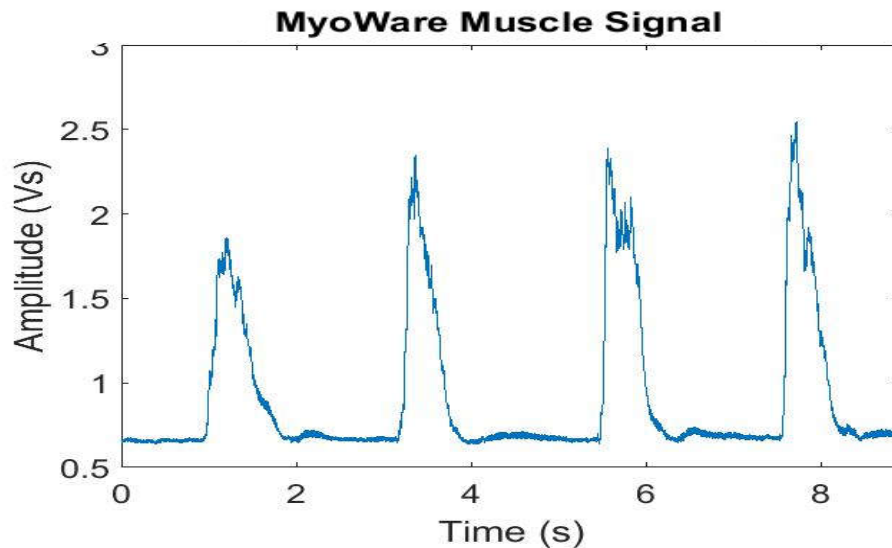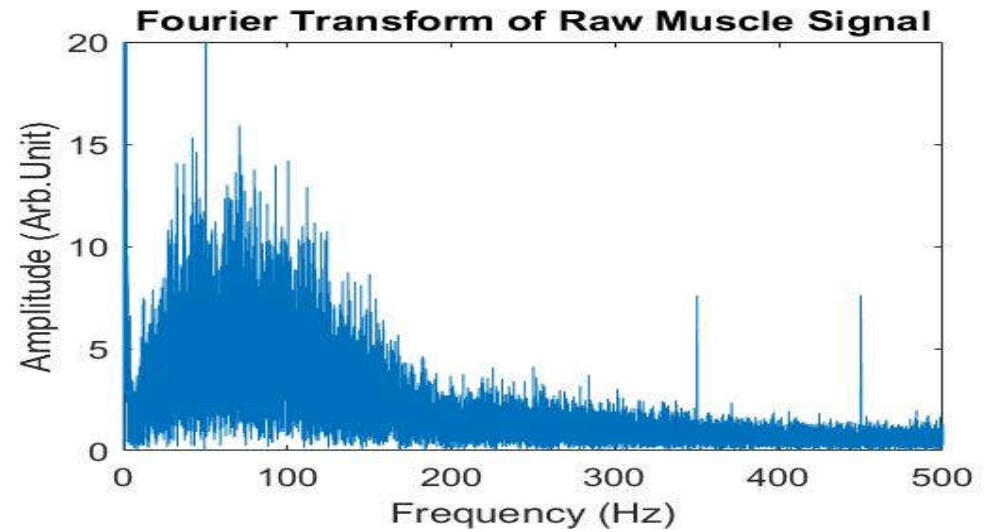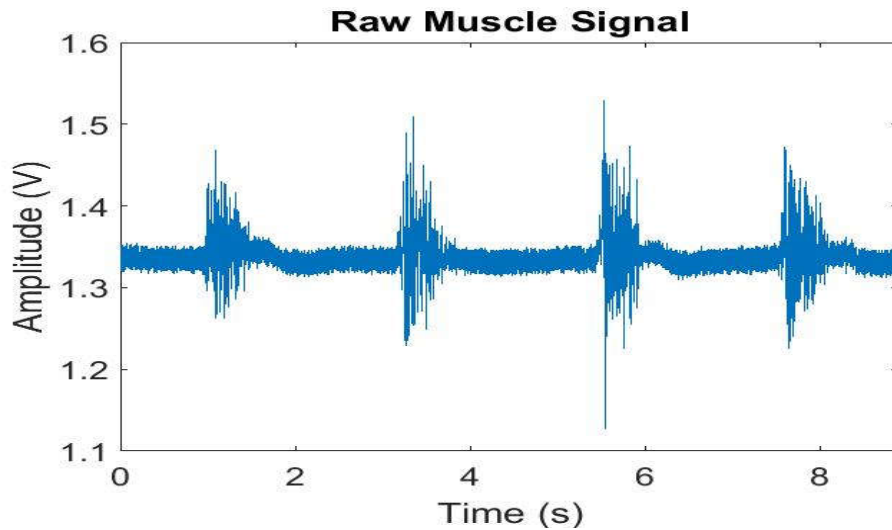
=

Superposed Surface Signal

Voltage (mV)

time (s)
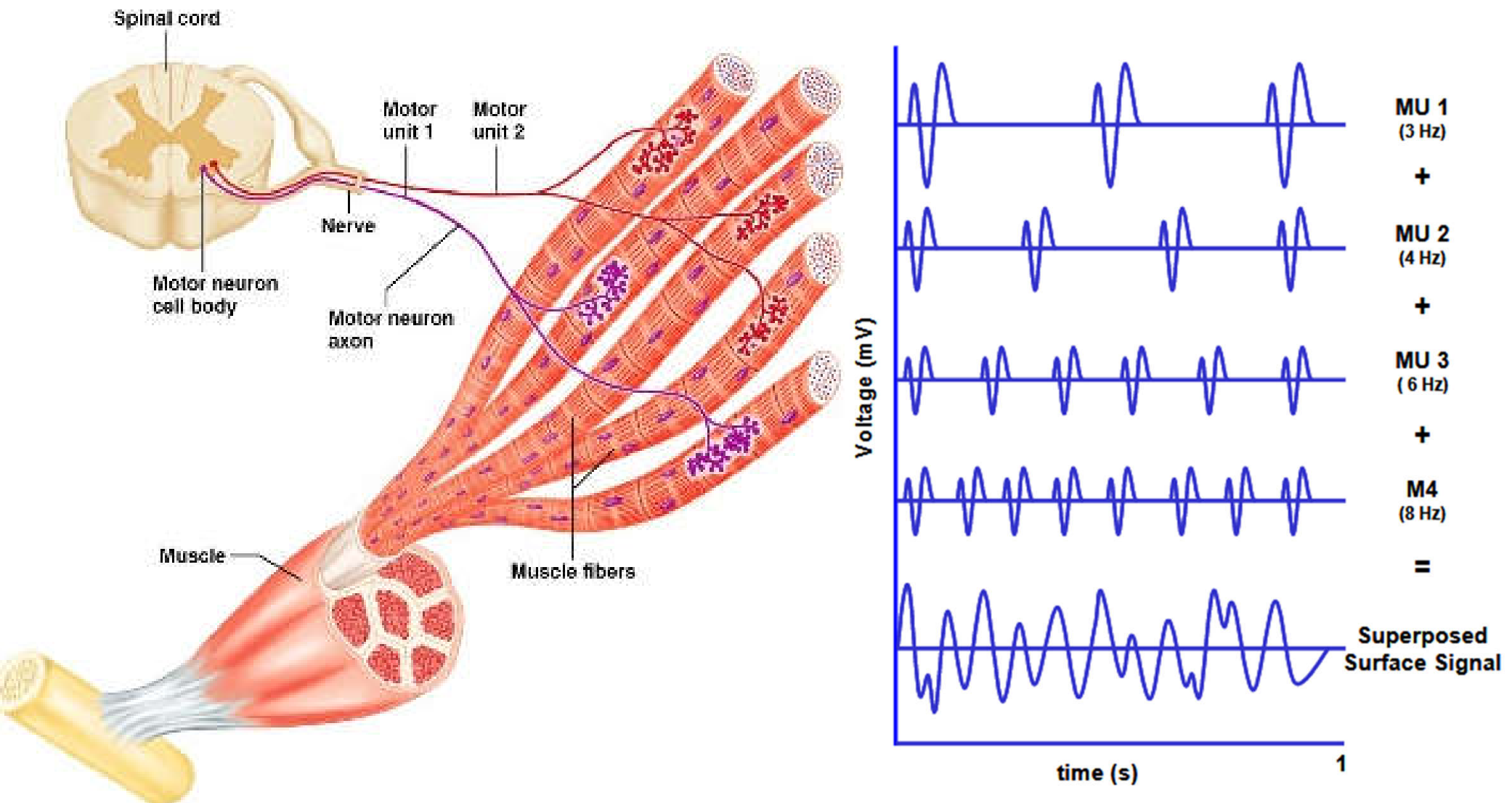
Source: Konrad, P. (2005). *The ABC of EMG: A Practical Introduction to Kinesiological Electromyography.* Retrieved June 2017 from: https://hermanwallace.com/download/The ABC of EMG by Peter Konrad.pdf

Two Types of Output Signals

Raw EMG Signal - 7
Shield Power (output) - 8
GND - 9

Adjustable Gain
End Muscle Electrode Snap

Reference Electrode Cable

Mid Muscle Electrode Snap
Power Switch

1 - Power Supply, +Vs
2 - Power Supply, GND
3 - Output Signal, SIG

4 - Mid Muscle Electrode Pin
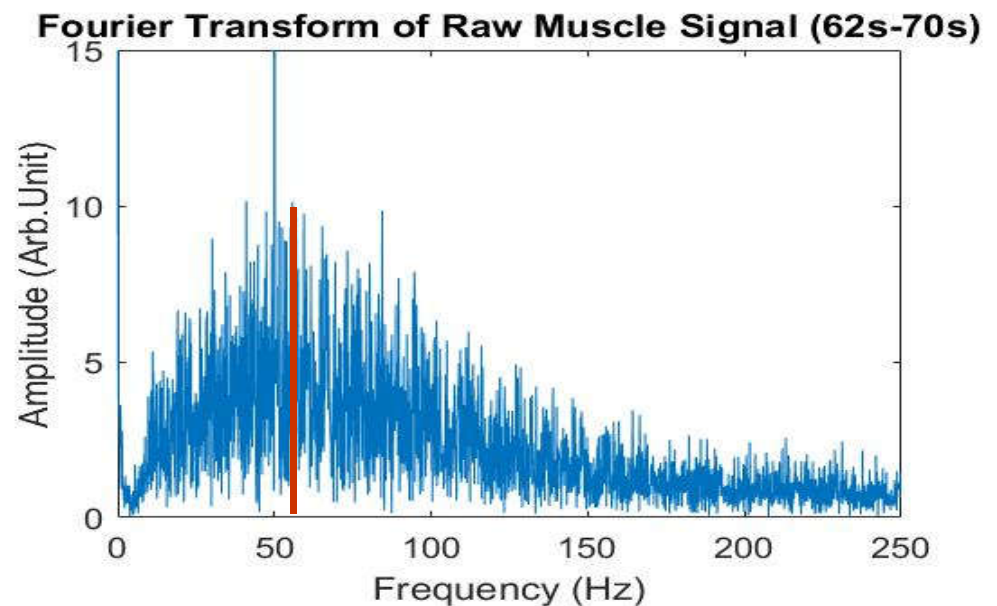5 - End Muscle Electrode Pin
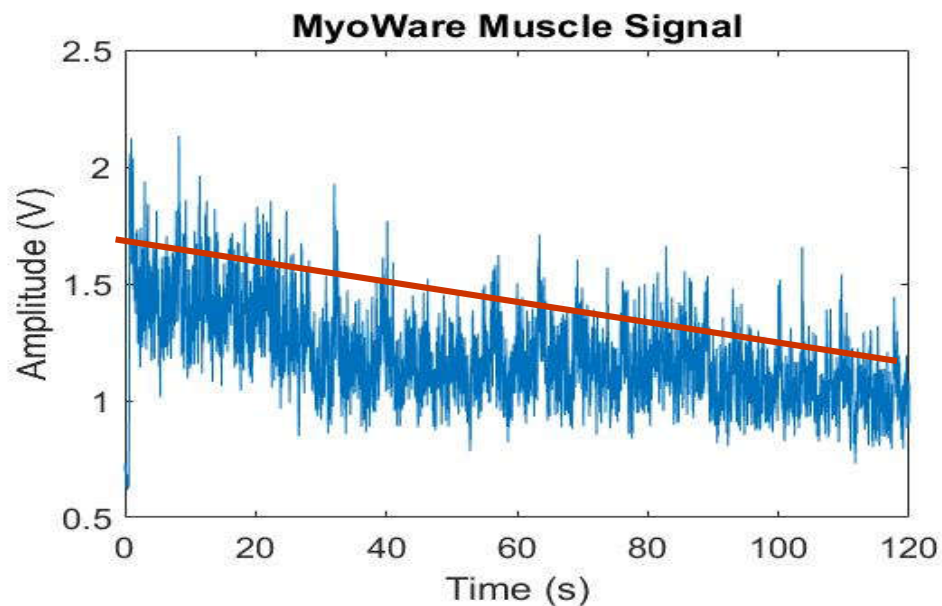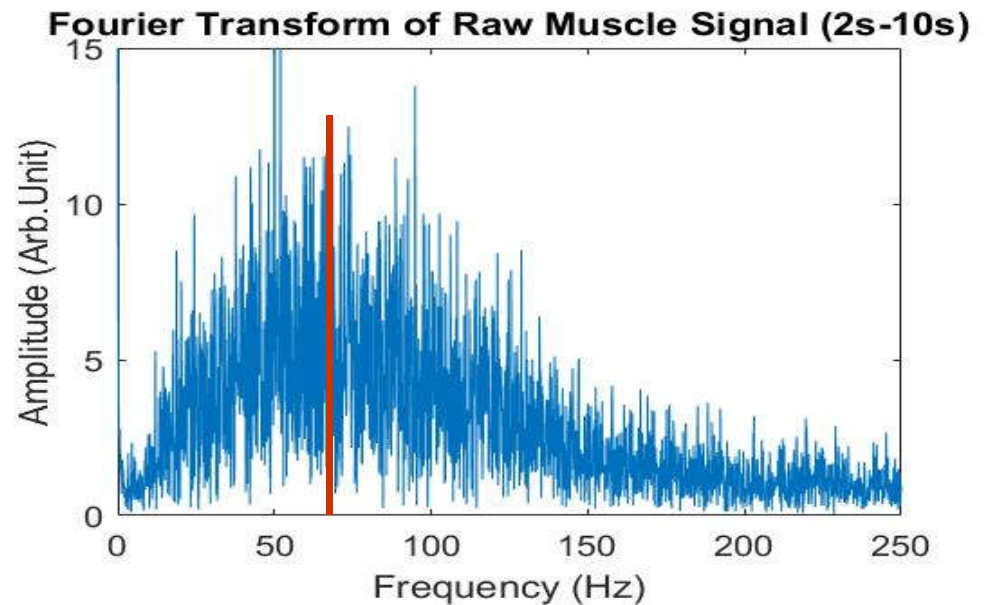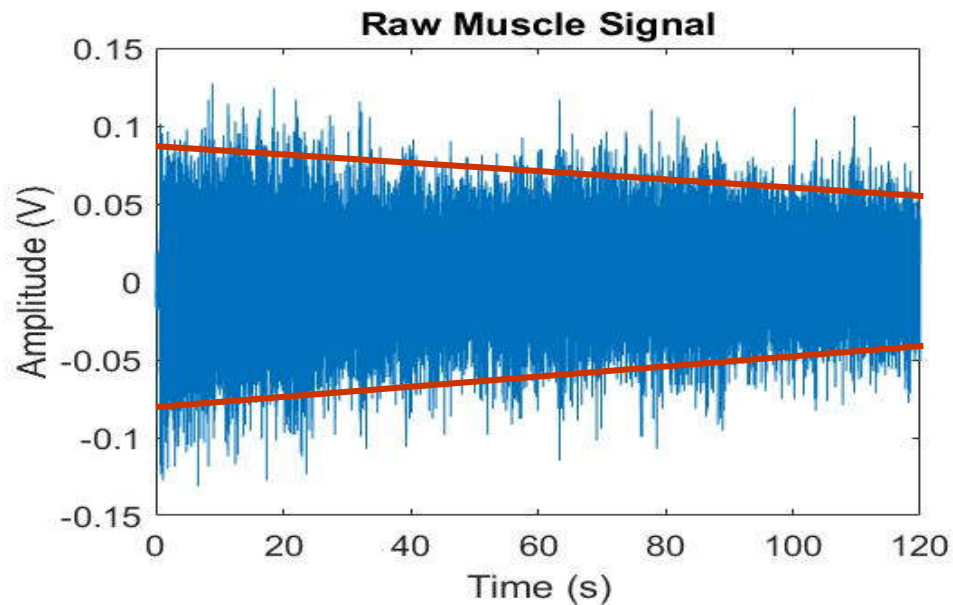6 - Reference Electrode Pin

Raw Signal VS MyoWare Signal
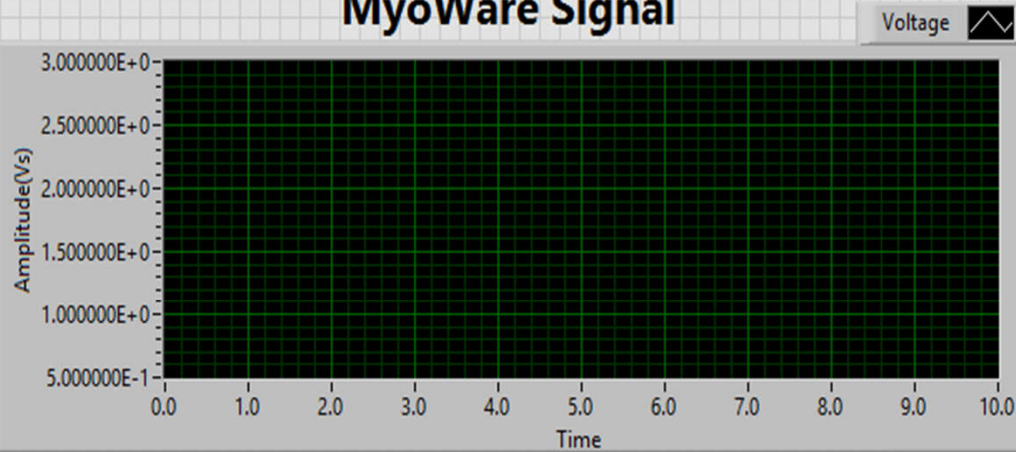

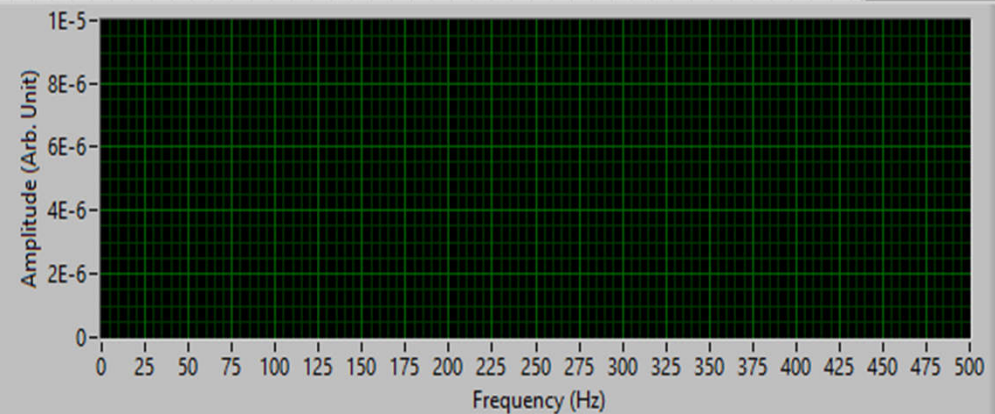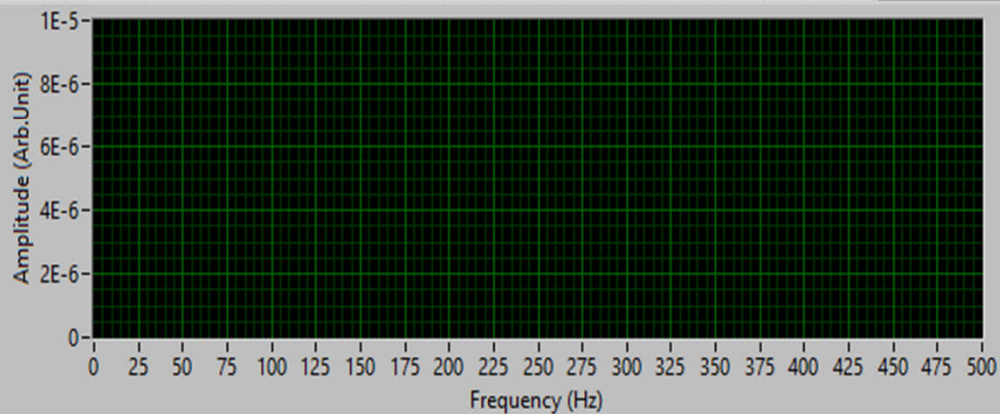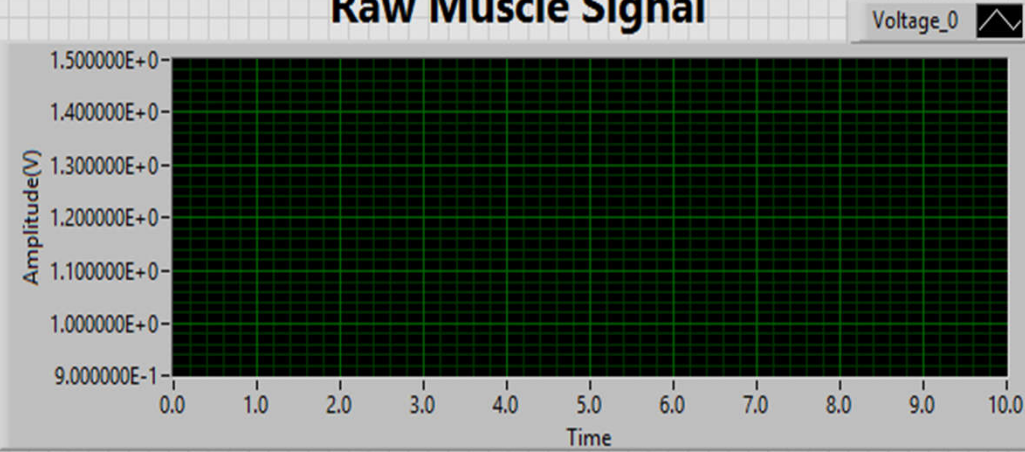* Sampling Rate: 1000Hz

The Usage of the Raw Signal
- e.g. Muscle Fatigue

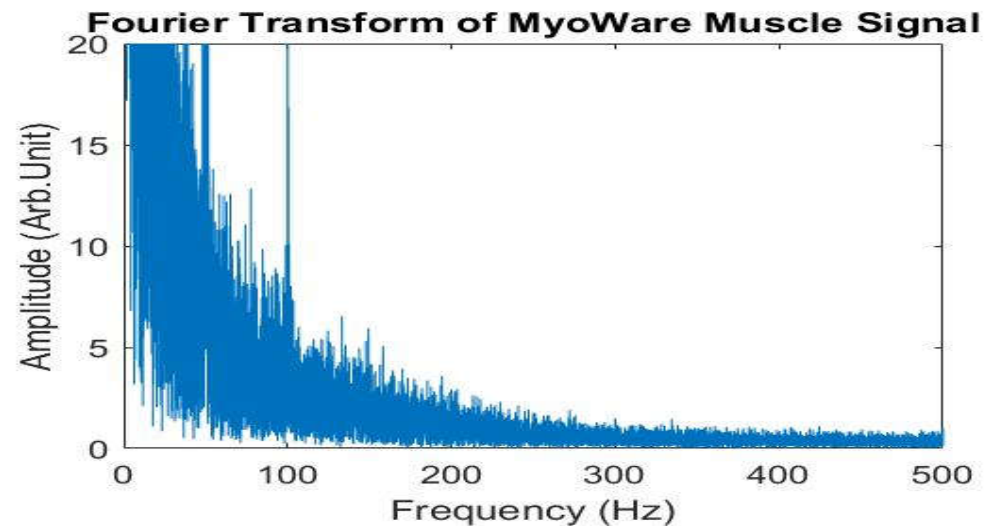# Real-time Muscle Condition Monitoring Program
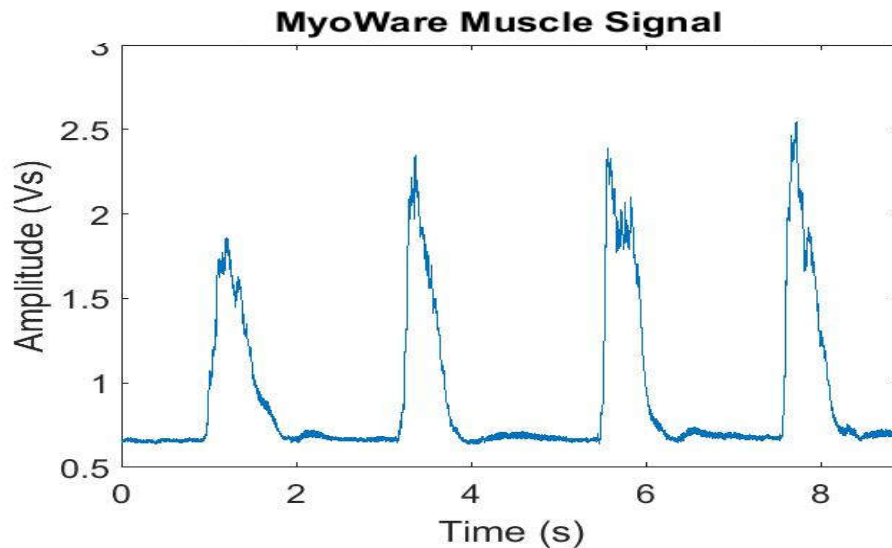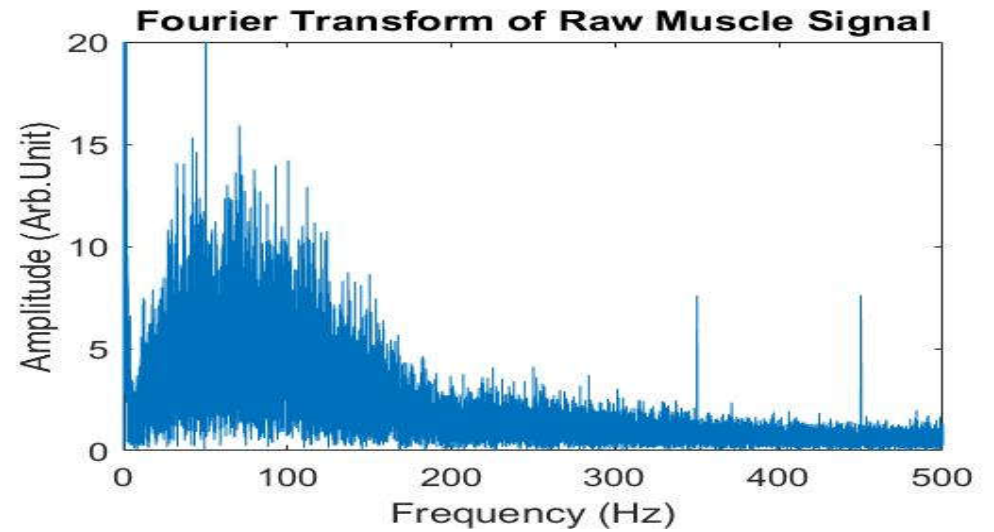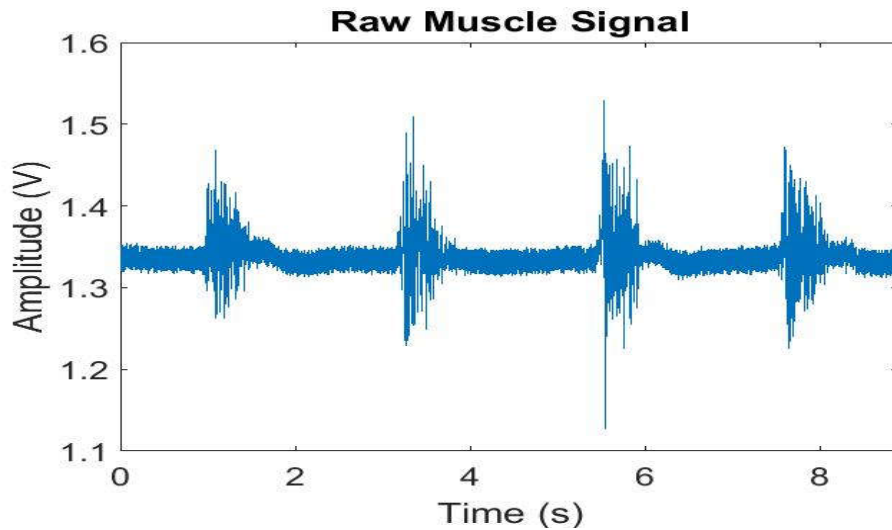
Raw Signal VS MyoWare Signal

* Sampling Rate: 1000Hz

The program:

Calibration Instruction:
1. Keep your muscle relaxed.
2. Press 'Calibrate' button to start.
3. Keep your muscle relaxed and wait for around 5 seconds.
4. Press 'Calibrate' button again to stop.
5. You can repeat the process 2-4 again if you moved your mucle or the sensor during the calibration.
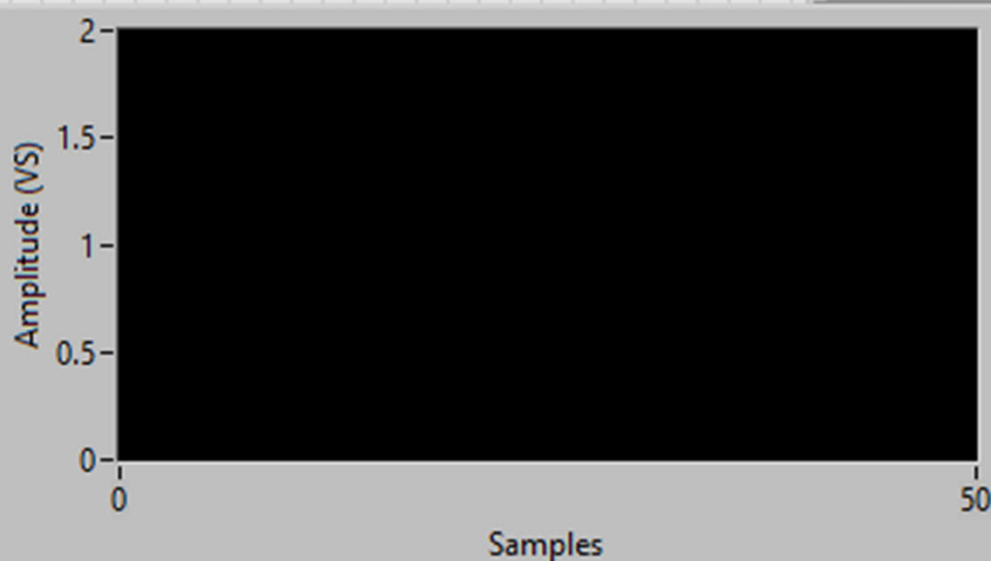6. Press the 'Exit' button when you are happy with your threshold.

Sampling Rate (Hz)

10

Virtual Key

SPACE

STOP

Total Contraction TImes

0

Current Muscle Power

0

Max Muscle Power

0

Calibrate

My Threshold

1

EXIT

Current Duration

0

Max Duration

0

Total Duration

0

My Muscle Signal

Amplitude (VS)

2 —
1.5 —
1 —
0.5 —
0 —
0 50

Samples

Muscle Signal

Threshold

0

Amplitude (vS)

3.0 —
2.5 —
2.0 —
1.5 —
1.0 —
0.5 —
0.0 —
0.0   25.0   50.0   75.0   100.0   125.0   150.0   175.0

Time (S)
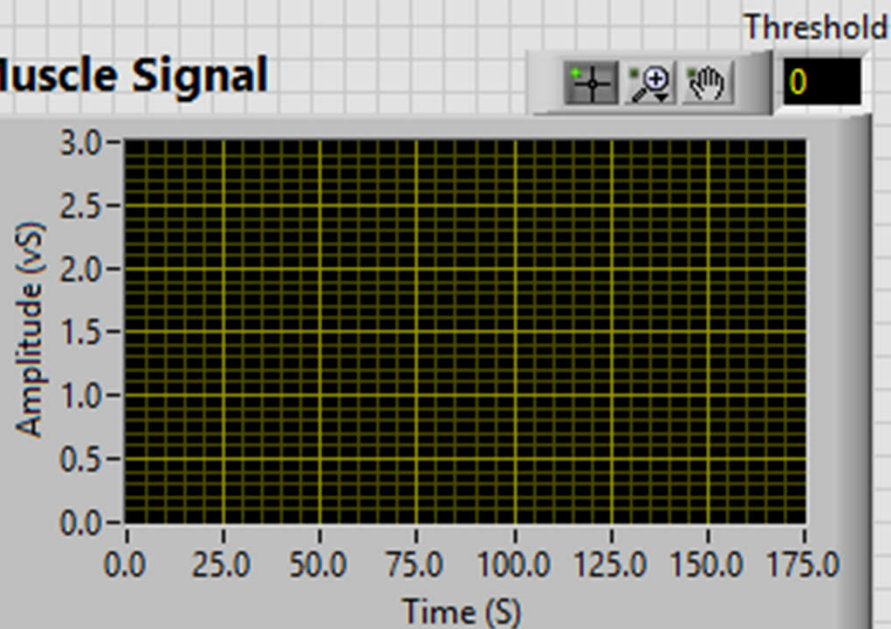
Let us try!

Calibration

Main Part

Total Contraction Times

Virtual Key

Total Duration

Max Duration

Sampling Rate (Hz)

Current Duration

Current Muscle Power

Max Muscle Power

Build XY Graph
X Input
Y Input
XY Graph

Muscle Signal

Threshold

DAQ Assistant
data
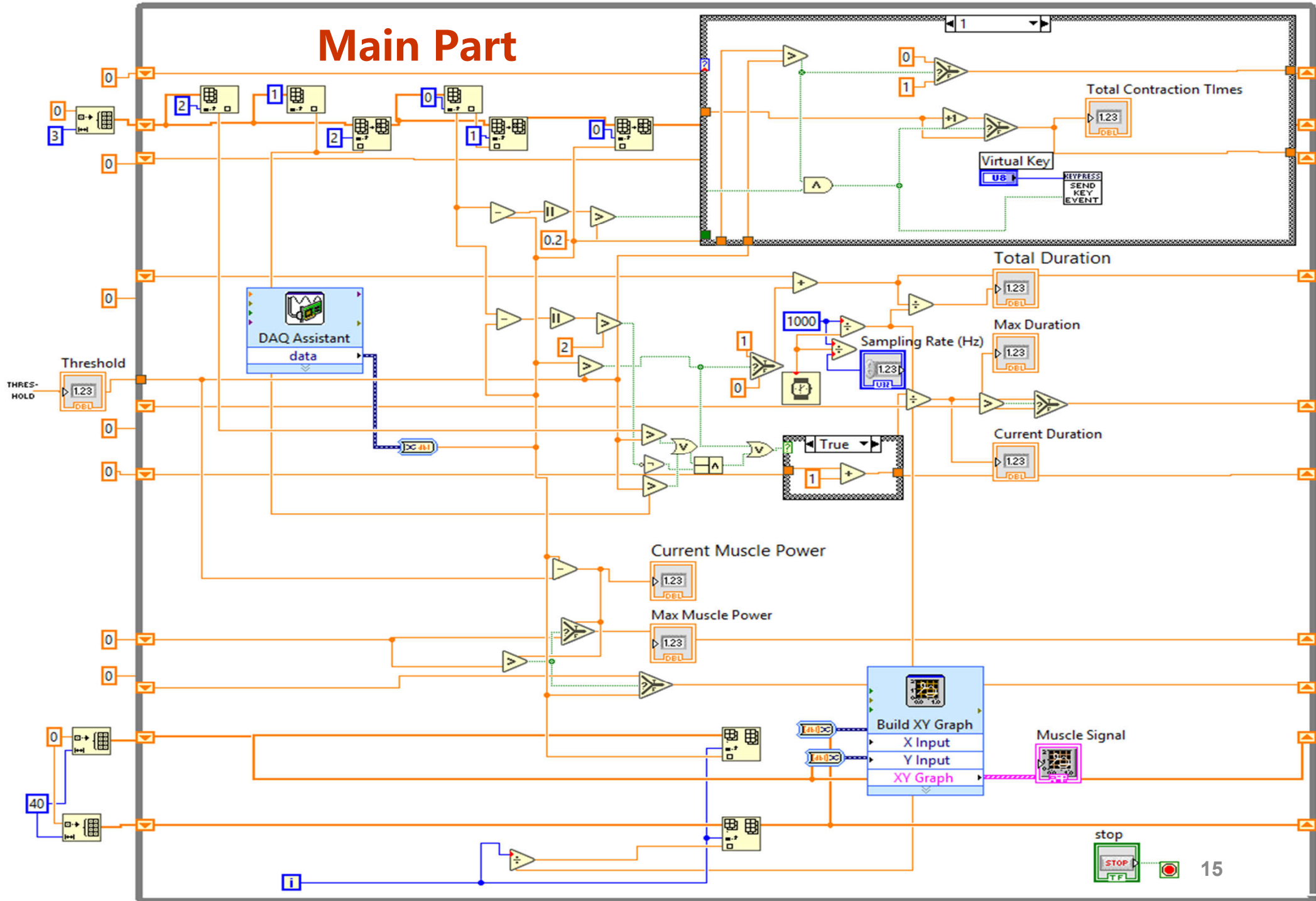
stop

15
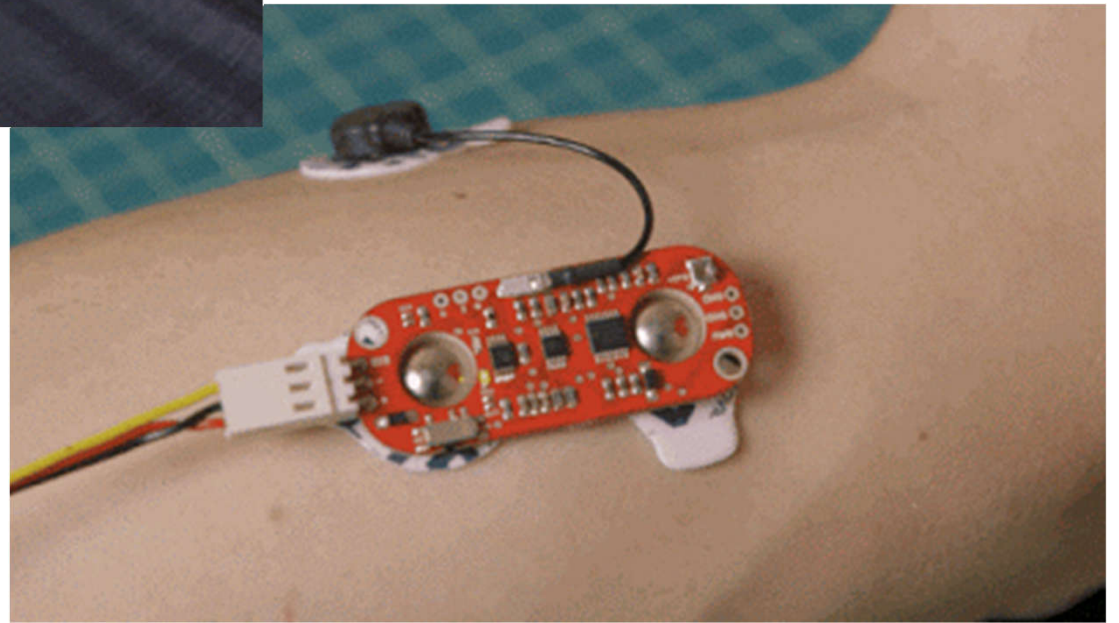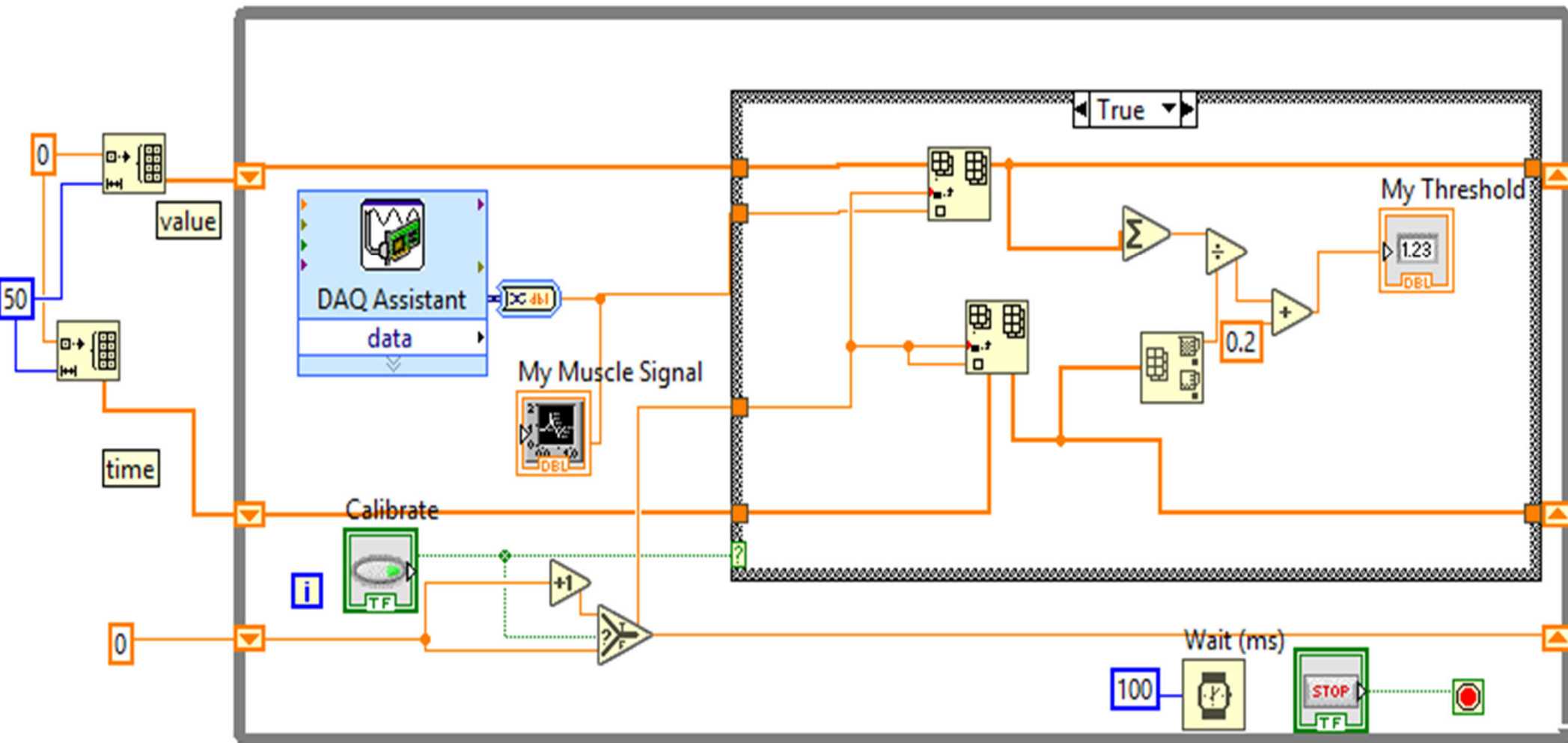
Further development!

- **Simulate more computer actions at one time**
  - **not only one-button game!**
  - **playing music!**
  - **...**
- **Use the raw signal instead of the MyoWare signal**
  - **combine the muscle fatigue monitoring**
  - **less lag**
  - **...**
- **A more suitable game for physical recovery**
  - **accommodate different patients**